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THE ROLE OF CERAMBYCIDAE IN FOREST, URBAN AND AGRICULTURAL ENVIRONMENTS

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In temperate regions, most larval Cerambycidae feed upon wood or solid tissues of dead or dying plants, less commonly in rotten wood. In the tropics, a greater proportion of species are live stem borers, but in either case, their primary ecological role is the reduction of wood to humus [Shelford (1913); Adams (1915)]. They play an important part in the succession of insects found in the various stages of a gradually disintegrating tree, a role which varies from host to host and region to region [Blackman and Stage (1918, 1924); Graham (1925); Richards (1926); Krogerus (1927); Ingles (1933); Savely (1939); Derksen (1941); Eidmann (1943); Palm (1950); Craighead (1950); Keen (1952); Becker (1955)]. However, in fulfilling this role they enter into competition with man for food, fiber and shelter [Craighead (1923, 1950); Linsley (1937); Keen (1952); Duffy (1953, 1957), etc.], and, as a result, economically, the family comprises one of the most important groups of insects in the world [Anon. (1957)]. The present summary enumerates some of the ways in which the species affect man's economy.

Forests.—In the economy of the temperate forest, Cerambycidae as a whole, play a beneficial, reducing role. However, when storms or fires sweep through forested regions and blow down or scorch commercial timber, Cerambycidae may destroy the wood before it can be utilized [Craighead (1950)] or develop in salvaged lumber [Kimmey and Furniss (1943)], subsequently emerging from structural timber [Eaton and Lyon (1955)]. Among species which attack living trees, many cause serious injury or death or attack wood with a high economic value to man. Thus, one small outbreak of one species affecting only eight square miles of forest, killed 45,000 trees aggregating nearly one million cubic feet of timber [Anon. (1957)]. Shiraki (1952) lists about 50 species injurious to forest trees in Japan, Escherich (1923) a similar number for the forests of Central Europe. The latter designates 21 species as serious pests of

coniferous wood, including five species which attack living trees, and 31 species, of which about 20 are also primary, which attack wood of broad-leaved forest trees. In North America, Craighead (1950) and Keen (1952) recognize about 20 species of twig girdlers, 12 of gall makers, 25 which bore under the bark or in the wood of living trees, and ten root borers as destructive forest pests. They list another 75 or more species which injure the wood of recently dead or felled trees with the bark on [of the 232 species "nuisables" listed by Beaulne (1932) for Canada, many are of minor importance].

In tropical regions, forest species are less well known, except in India, Burma, and Ceylon, where they are regarded as the most destructive group of forest insects. Beeson and Bhatia (1939) have summarized data on 350 species associated with 568 species of trees, shrubs and woody climbers. The sal tree (*Shorea robusta*) has 37 species which attack it, and large numbers are also associated with certain other trees. One dry wood borer, *Stromatium barbatum* (Fabricius), has 311 known food plants. In South America, more than 100 species injurious to forest trees are enumerated by Costa Lima (1936) and Bosc (1942); numerous African species by Duffy (1957). In South Africa and Australia various species damage forest reserves and plantings, especially of wattles (*Acacia*) and gums (*Eucalyptus*) [Tillyard (1926); Tooke (1949); Dürr (1954)], and even the introduced Monterey pine is subject to attack [McKeown (1947); Gourlay (1951)].

In Central and South America, a large number of species have pruning habits and contribute to the littering of the forest floor. Thus, the parent beetles of *Oncideres* ("serradores") girdle twigs and branches, in some cases an inch or more in diameter, and oviposit beyond the girdle, thereby providing freshly killed tissue in which the larvae can develop [Fonseca (1931); Linsley (1940); Bruch (1941); Bosc (1942); Bondar (1954)]. In some cases, at least, the adults also score the bark with the mandibles to loosen it as an aid to larval feeding [Lane (1944)]. This habit also contributes to the increase of other wood boring insects which avail themselves of the niche provided by *Oncideres* [Linsley (1940)].

Forest products.—Larvae of Cerambycidae cause serious defects in lumber, some resulting from attack on living trees, others shortly before cut logs are sawed. In temperate forests, the

resultant reduction in grade probably causes a greater monetary loss than do the tree-killing species [Craighead (1950)]. Further, defects in living trees are frequently enlarged by other insects until the heartwood is completely destroyed.

Damage to seasoned lumber by roundheaded borers may occur where lumber is seasoned or stored in open yards near forests [Miller (1943)]. However, very few species oviposit on dry barkless wood and thus become domestic pests. An exception is the "old house borer" or "Hausbock," *Hylotrupes bajulus* (Linnaeus), which is particularly destructive in central Europe, but has been introduced by commerce into other continents. The larvae feed in the sapwood, and to a lesser extent the heartwood of dry, seasoned, coniferous timber such as telephone poles, fences, and roof and attic supports. Duffy (1953) and Dürr (1954, 1956) have summarized the economic importance of this species and provided extensive bibliographies. However, the Indian *Stromatium barbatum* Fabricius also attacks wooden structures, including furniture, supporting timbers, panels, shelves, etc. [Beeson and Bhatia (1939); Emden (1937); Menon (1954)] and a number of others infest wood prior to utilization and cause damage through subsequent emergence [Houlbert (1912), Leech (1944), Dürr (1952); Eaton and Lyon (1955)]. Emerging adults will sometimes gnaw through hardwood flooring, veneer, sheet rock, asphalt roofing, zinc and lead, not to mention rugs and softer household materials, or damage furniture [Craighead (1923); Shafik (1928); Linsley (1938); Duffy (1953)]. Structural timbers in contact with the ground are also subject to direct attack, especially when old and moist. Thus Lundberg (1957) reports *Chlorophorus herbsti* Brahm in an old oak fence, Palm (1957) damage to railroad ties by *Leptura* spp., and MacSwain (1958) injury to fencing and lumber by *Anoplodera crassipes* (LeConte).

Shade trees.—In temperate regions, roundheaded borers mostly attack shade trees only when other factors, such as defoliation, diseases, drought, frosts, or transplanting make them susceptible to attack [Felt (1905-06); Herrick (1935)], and it is often difficult to place responsibility for the death of the tree [Craighead (1950)]. However, Pechuman (1940) considers feeding by adults of *Saperda tridentata* Olivier of primary importance in the transmission of Dutch Elm disease, and *Anoplodera nitens*

(Förster) has been charged with carrying the spores of chestnut blight [Grandi (1951)]. *Monochamus* spp. have also been implicated in the transmission of diseases of forest trees [Reid (1958)].

In tropical regions, living shade and ornamental trees are attacked by a large number of Cerambycidae [Beeson and Bhatia (1939); Costa Lima (1936); Duffy (1957)]. Thus, *Aeolesthes sarta* Solsky is a very serious tree killer in Afganistan and western Pakistan [Vogt (*in litt.*)].

Fruit and nut trees.—Trees grown for fruit and nut crops, both native and introduced, are also widely attacked by cerambycids. Of 118 kinds of injurious Cerambycidae in Japan, 49 are associated with fruit or nut trees, including mulberry, and four with grape vines [Shiraki (1952)]. In Australia [Lea (1902)], parts of Asia [Batra (1942); Deshpande and Karandakar (1948); Janjua and Mehra (1949)], and in North America [Craighead (1923)] the more important pome fruits are attacked by species formerly associated with the native trees, as the *Amelanchier* and *Crataegus*-infesting apple-tree borers (*Saperda* spp.) of New England [Brooks (1920a, b); Hess (1940)]. In most areas where grapes are grown, various endemic Cerambycidae attack the vine [Mayet (1890); Craighead (1923); Shiraki (1952)]. Sometimes a species ordinarily considered to be secondary will suddenly become a pest of the living 2- or 3-year-old wood, as *Chlorophorus varius* Mull. in Egypt [Zoheiry (1950)], and in Europe, the imported North America *Neoclytus acuminatus* (Fabricius), considered to be a polyphagous dead wood feeder at home, appeared as a serious vine pest in various Italian localities [Manzoni (1930a, b)]. Several species of *Oberea* girdle stems of fruit and nut crops, one of the best known being the raspberry cane borer, *O. bimaculata* (Oliver), which is also injurious to perennial asters [Hugerford (1939)].

Although fruit tree injury is usually caused by cerambycid larvae, adults may scar the fruit surface [King (1920)], or burrow into soft fruits, such as ripening peaches [Gunn (1916)].

However, by far the most important cerambycid pests are those which attack tropical and subtropical fruits and nuts [Nguyên-Cong-Tiêu (1928); Sharma and Singh (1940); Gressitt (1942); Mendizabal (1943); Rehman (1943, 1946)], including such crops as cloves [Kalshoven (1936)], coffee [Maxwell-Lefroy (1909); Vayssière (1935); Costa Lima (1936); Corella

(1942); Lepesme and Villiers (1944)], cacao [Costa Lima (1936, 1955); Risbec (1937); Corella (1942)], fig [Horton (1917); Kalshoven (1955); Gunn (1919); Husain and Khan (1941); Shiraki (1952)] and citrus [Waterston (1940); Pruthi and Mani (1945); Chang (1954); Taylor (1957)]. Fig growing is impossible in some parts of India because of attack by Cerambycids [Anon. (1957)]. Forty-eight species attack native and introduced species of *Coffea* in tropical Africa, and native species have taken to *Citrus* in most of the areas where it has been introduced. In eastern Asia, at least four of these last are major pests [Clausen (1931), Hoffman (1934); Gressitt (1942); Lieu (1945, 1947)], including *Anoplophora macularia* Thomson, which in some areas infests 90 per cent of the trees in spite of preventive measures [Anon. (1957)]. Another 15 species, although occasionally destructive, are regarded as minor pests [Hubbard (1885); Back (1918); Bitancourt, Fonseca and Autuori (1933); Costa Lima (1936); Dumbleton (1937); Cottier (1938)]. Most of these are polyphagous and have turned to citrus from distantly related hosts, but in Australia *Citriphaga mixta* Lea, overlaps from the desert kumquat (*Eremocitrus glauca*) [Froggatt (1919)] and *Uracanthus cryptophagus* Olivier from the native finger lime (*Microcitrus australasica*) [Olliff (1892)], one or two are probably native to that host [Kunhi (1928); Murthi (1931); Ramachandran (1953)].

Although several polyphagous Cerambycidae attack palms in various parts of the world, relatively few species are regularly associated with this group of plants [Lepesme (1947)]. However, at least three (e.g. *Olethrius tyrannus* Thomson, *O. insularis* Fairmaire, *Xixuthrus costatus* Montrouzier) attack coconut in the South Pacific, several are associated with the date palm [e.g. *Polyarthron pectinicornus* (Fabricius), *Apatophysis barbara* Lucas, *Pseudophilus testaceus* Gahan] in Asia Minor or North Africa, *Macrodontia cervicornis* (Linn.) infests the piassava palm (*Attalea funifera*) in Brazil [Costa Lima (1936)], and a few others are attached to *Chamaerops* in the Old World tropics or to *Sabal* in the New World.

Vegetable and Field Crops.—As pests of vegetable and field crops, cerambycids are less well known. However, species of *Phytoecia*, which live in the stems of umbellifers and composites are capable of severe injury to seed carrots [Kemner (1918),

Duffy (1953) and to Jerusalem artichoke [Shiraki (1952)], and have been accused of damaging cabbages [Grandi (1951)]. Stems of sweet potato in Java are injured by *Nupserha fricator* Dalman [Kalshoven (1955)], those of egg plants in British Guiana by *Alcidion deletum* Bates [Cleare (1931)], and those of cucurbits in Argentina by *Bebelis lignosa* Thomson [Bosc (1942)]. *Ropica dorsalis* Schwarzer and three species of *Apomecyna* bore in water melon, musk melon and cucumber vines in China or Japan [Gressitt (1942); Shiraki (1952); Shu-Chen (1952)], and related species attack stems of French beans in Portuguese East Africa [Saraiva (1939)], of pumpkins and melons in the Sudan [Pollard (1954)], South Africa [Fuller (1914)], and Queensland [May (1946)]. In southwestern United States, the larvae of *Dorcasta cinerea* (Horn) bore in stems of sunflower and other oil-seed crops, as do those of *Agapanthia dahli* Richter in the Ukraine [Paramanow (1953)]. Similarly, *Ataxia hubbardi* Fisher infests stalks of cotton in Texas [Morgan (1907)], as does *Tragiscoschema bertolonii* Thomson in Mozambicque [Lesne (1930)], and *T. wahlbergi* Fahr and *Volumnia westermanni* Thomson in Portuguese East Africa [Saraiva (1939)]. In southern Europe, stems of wheat, barley and rye are fed upon by larvae of *Calamobius filum* Rossi [*Grandi* (1951)], and in North America the related *Hippopsis lemniscata* (Fabricius) attacks the stems of *Vernonia* and other plants [Schwitzgebel and Wilbur (1942)]. Stems of jack-beans in Hawaii are infested with *Sybra alternans* Wied. [Swezey (1928)].

A number of subterranean forms are injurious to turf and grass plots, as the North American *Homaesthesis emarginatus* Say [Craighead (1923)] and the European *Dorcadion fulginator* (Linnaeus) [Grandi (1951)]. The roots of maize are damaged by *D. arenarium* Scopoli in Italy [Grandi (1951)], those of sugar cane by larvae of *Philus pallescens* Bates in China [Gressitt (1942)] and by various Prioninae and Lamiinae elsewhere [Box (1953)]. In the Mediterranean region, larvae of *Vesperus* are especially injurious to roots of alfalfa, root vegetables, and potato tubers [Grandi (1951)]. The larvae of *Plocaederus* feed in the roots of *Ferula asafoetida* in Afganistan [Vogt (*in litt.*)] and those of *Thyestilla gebleri* Falderman, sever the roots of hemp in Japan [Kojima (1929)]. Dry derris roots are also attacked by

numerous Cerambycidae both in Asia [Miller (1934)] and in South America [Downes and Williams (1950)].

Seed infesting species.—Although seeds of various plants, in particular conifers and legumes, are attacked by a great variety of insects, few are regularly utilized by Cerambycidae. A North American *Paratimia* and an Indian *Chlorophorus* infest full-grown green or maturing pine cones [Fisher (1915); Champion (1919)]. The South American lamiine *Lophopoeum timbouvae* Lameere feeds in the seed pods of various legumes [Bruch (1940); Bosc (1942); Costa Lima (1955)], as does a species of *Leptostylus* in Puerto Rico [Wolcott (1923)]. A related species lives in the fruits of *Sapindus* in Brazil [F. Lane (*in litt.*)], and *Baryssinus leguminicola* Linell in the seeds of *Enterolobium* in Paraguay [Chittenden and Linell (1896)]. In North America, *Lepturges spermophagus* Fisher infests unripened seeds in green pods of cowpeas in Mexico [Fisher (1917)], and *Ataxia sulcata* Fallén and *Leptostylus terraecolor* Horn, mangrove seeds in Florida [Craighead (1923)]. In Africa, several species of *Sophronica,* small lamiines of the tribe Apodasyini, develop in dry coffee berries [Anderson (1930); Lepesme (1950)]. Other species of the same genus infest fruits of *Parkia,* and also seeds of *Acacia,* along with the tetraopine, *Enaretta castelnaui* Thomson [Duffy (1957)].

Orchids and flowers.—In Java, a larval *Diaxenes* lives in the fleshy roots of various orchids and the adults feed on young leaves, flowers and fruits [Franssen and Tiggelovend (1937)]. Related species infest orchids in Burma and the Philippines [Gahan (1894); Swezey (1945)].

Garden plants, especially those with woody stems, as roses and crotons, are also subject to attack by Cerambycidae [Hardouin (1945); Setty and Rao (1953)]. However, in Europe, larvae of *Parmena* are destructive to plants like asphodels, hellebores, and euphorbias [Villiers (1946); Grandi (1951)], and various species of *Phytoecia* damage the stems of ornamental umbellifers, borages, and composites, including *Achillea* and *Chrysanthemum* [Gressitt (1942); Grandi (1951); Shiraki (1952)].

Opuntia cactus.—The escape of ornamental American *Opuntia* cactus in rangelands of Australia and South Africa has led to the intentional introduction of cactus insects, including Cerambycidae [Dodd (1940); Pettey (1946, 1953)], in the hope of

retarding the spread or establishing biological control of this weed. *Moneilema ulkei* Horn, *M. variolare* Thomson, and *Lagochirus funestus* Thomson were introduced into Australia from Texas and apparently established, but proved of minor importance in comparison to the moth, *Cactoblastis cactorum* (Berg.) from South America [Dodd (1940)]. *M. ulkei* was introduced and reared in South Africa but apparently never released [Lepesme (1950)]. On the other hand, nearly 300,000 individuals of *L. funestus* were released between 1942 and 1945 in the most heavily infested areas, but although it has more than three annual generations, and supplemental releases have been made, the populations have continued to decline. Lepesme (1950) attributes the lack of success in establishing the species to the drowning of larvae in sap produced by the plant, predation on the adults by ants, spiders and lizards, and the reduction of oviposition influenced by lack of rainfall. Weber (1951a, b, 1952), Dodd (1952), and Fullaway (1954) record the release of *Moneilema armata* LeConte, *M. crassa* LeConte, and *L. funestus* on the Island of Hawaii as part of a program to suppress the tree cactus, *Opuntia megacantha,* and indications were that *L. funestus,* at least, would become established, as it has in Australia [McKeown (1952); Lepesme (1958)]. More recently, *Aerenicopsis championi* Bates, has been introduced from Mexico as a potential agent for the biological control of lantana [Weber (1956)].

Dispersal by commerce.—Cerambycidae have been dispersed accidentally by commerce in various parts of the world, but not so readily as bark beetles. Thus, although New Zealand has nine introduced species [Hudson (1934); Blair (1937)], five of these are from Australia, and in North America, the less than half a dozen introduced species are all of European origin. Possibly no cerambycids have been so widely dispersed by commerce as two of the smallest European species, *Nathrius brevipennis* (Mulsant) and *Gracilia minuta* (Fabricius), which have been carried to all the continents in wicker work, particularly willow basketry. However, in California, where the former species is now established it attacks primarily dead and dying twigs of walnut and fig [Middlekauff and Underhill (1949)]. The asiatic clytine *Chlorophorus annularis* (Fabricius), carried over the world in bamboo, has not been established in areas where this plant is not endemic. Likewise, the North American *Eburia quadrigeminata* Say, although

commonly transported through commerce in furniture [Cann (1937); van Emden (1939-40); Blair (1948)] has failed to establish overseas. A related species, *Xystrocera globosa* Olivier has been widely dispersed in Asia and is established in the Mediterranean region [Peyerimhoff (1945)], and the large asiatic *Batocera rubra* Linnaeus is now found in Puerto Rico [Wolcott (1956)].

Among Cerambycidae dispersed by commerce, Australian Phoracanthini are deserving of special mention [Lepesme (1950)]. Even locally they are readily transported in firewood, are commonly found in houses, and have the vernacular name "firewood beetles" [Tillyard (1926)]. *Phoracantha semipunctata* (Fabricius) has become established in South Africa [Lounsbury (1918)], Portuguese East Africa [Saraiva (1939)], South America [Bruch (1918); Bosc (1943); Santis (1945)] and the eastern Mediterranean basin [Lepesme (1950a); Bytinski-Salz (1952); Neumark (1953); Alfieri (1957)] where it infests *Eucalyptus globulus* and other introduced species of gum. *P. recurva* Newman has followed *Eucalyptus* to New Zealand [Tillyard (1926)], as have *Coptocercus rubripes* Boisduval and *C. truncatus* Aurivillius [McKeown (1947)]. *Coleocoplus senio* Newman, another Australian phoracanthine, has become established in Fiji on "turpentine tree," *Synacarpia laurifolia,* [Lever (1946); McKeown (1947)]. On the other hand, very few native cerambycids attack living eucalyptus in areas where it has been introduced. Exceptions include *Phymatioderus bizonatus* B. in Chile [Porter (1940)] and *Paramallocera iliniza* Kirsch in Ecuador [Rodriguez (1945)].

Summary

In the temperate regions of the world, most Cerambycidae are forest scavengers and relatively few species attack and kill living trees. Some of these, however, are of considerable economic importance in relation to forest, fruit and ornamental trees. More are of significance because of attacks or injury to recently felled or fire or storm damaged trees. A few attack or injure forest products, seeds, vegetable, field, and ornamental crops or garden plants. In general, their greatest importance is in relation to tropical agriculture and forestry where they injure some of the most valuable timber and horticultural crops in the world. A few species have been utilized in the suppression of weed plants, as

cactus, and some have been transported about the world unintentionally by man.

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BOOK NOTICES

EVOLUTION AND CLASSIFICATION OF THE MOUNTAIN CADDISFLIES. By Herbert H. Ross. vii+213 pp., 370 text figs. (most are compound), 45 text charts. Urbana: The University of Illinois Press. July 27, 1956. Price $6.00.

This book is a "must" for trichopterists and for taxonomic libraries, since it contains the original descriptions of 4 new genera (one from Baltic amber), 8 new subgenera, 32 new species, and in addition 4 new species of *Wormaldia* with E. W. King as co-author. It is of interest to workers in many other groups, especially aquatics, because of the unusually full and illuminating geologic and biogeographic analyses, and as a model in procedure in an investigation of phylogeny. The histories and dispersal patterns of the three most primitive families of Trichoptera, the Philopotamidae, Rhyacophilidae and Glossosomatidae, are investigated on a world basis.

ANNOTATED CATALOGUE OF AFRICAN GRASSHOPPERS. By H. B. Johnston. xxii+833 pp. New York: Cambridge University Press. January 16, 1957. Price $18.50.

This must be a nearly perfect catalogue for its purpose. The extended format used for the very full synonymies has resulted in a large and expensive book, but will save users endless time. The area covered is that of the continent of Africa, with the adjacent islands of the Atlantic and the Indian Ocean, but not those of the Mediterranean.

The species in each genus are arranged alphabetically. For each species the type locality (plus sexes described) and wherever possible the present location of the type or types, are given; then a numbered synonymy with references, and by use of these numbers a concise listing under the headings Desc., Figs., Ecol., Bion., Econ. and Dist. — HUGH B. LEECH, *California Academy of Sciences, San Francisco.*

A NEW GENUS OF TYCHINI FROM CALIFORNIA

(Coleoptera: Pselaphidae)

ROBERT O. SCHUSTER[1] AND GORDON A. MARSH[2]

The tribe Tychini has been represented in California by five species of "*Tychus*." In attempting to name specimens of this tribe from California, it became apparent that a number of undescribed forms existed, and that two genera were involved, neither of which are congeneric with the European *Tychus* of Leach. This paper proposes a new genus for that segment of the California fauna which is unique in the asymmetry of the male genital structure. The other group, with symmetrical genital structures, is similar in many respects to the genus *Cylindrarctus* of the eastern United States and is not included in this study.

We wish to acknowledge the loan of material from the following institutions and collections: The California Academy of Sciences, the California Insect Survey, the collection of Dr. Orlando Park, the University of California at Davis, and the United States National Museum. Information and specimens of the type species, *Tychus niger* (Paykell), were furnished by Claude Besuchet of the Muséé Lausanne, Suisse.

The illustrations accompanying this paper have been drawn by us with the aid of a compound microscope and ocular grid. They are sufficient in detail only to the extent necessary to insure recognition of the species being considered.

Since the descriptions, illustrations and measurements have been made from slide-mounted male specimens, it is recommended that similar mounts be made of specimens that are to be compared with the information in this paper.

Numerous additions to this genus may be expected to result from future collecting in large uncollected geographic areas. Due to uncertain locality data, or the absence of male specimens, a few undescribed forms are not considered. The specimens thus far known are mainly from, or contiguous to, the montane areas of central and southern California. Two species occur in the Sacramento Valley, but the mountainous areas of the state will probably be found to contain the majority of the species.

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[2] Berkeley, California.

Hesperotychus Schuster and Marsh, new genus

Type of genus: *Hesperotychus adustus* Schuster and Marsh, new species.

Tychini in which the following characters occur consistently: (1) Head with large, prominent eyes. (2) Antennal club of three segments, noticeably wider than those preceding. (3) If present, two isolated vertexal foveae visible from above. (4) Third palpal segment not more than 75 per cent length of fourth. (5) Fourth segment of maxillary palpus not bearing conspicuous integumental projection other than cone. (6) Pronotum with two basolateral foveae and the base with one moderate central fovea and from zero to six small punctures. (7) Elytron with two antebasal foveae, discal stria and simple flank. (8) Abdomen of five visible tergites in either sex, seven sternites in the male, six in the female. (9) Male protrochanter spined and metatrochanter spined or flanged, mesotrochanter not modified. (10) Protibia and metatibia usually with distal spine, mesotibia usually simple. (11) Second metatarsus equal to or shorter than third. (12) Tarsal claw and accessory present, claw of male proleg cleft. (13) Male genitalia asymmetric.

This genus is similar to *Tychus* in the asymmetry of the male genital structure. However, the placement of the parameres in *Tychus* is lateral (fig. 13), whereas in *Hesperotychus* it is apical. *Tychus* exhibits sexual dimorphism in the fifth antennal segment while *Hesperotychus* does not. None of the European species have male sexual modification of the trochanters, and while this character is of doubtful generic value, its occurrence in all of the California species has influenced its use in this paper.

The species comprising this genus are closely related and the male genitalia in conjunction with the secondary sexual characters of the male trochanters provide the more usable variables upon which the species are based. Minor differences between these structures are observed even in the small population samples presently available. However, the possibility of a species transgressing the noted discontinuities is highly improbable.

Hesperotychus adustus Schuster and Marsh, new species

(Figs. 1, 2, 3, 15, 19, 20)

Male (slide). Head .30 mm. long × .25 mm. wide; pronotum .33 mm. × .34 mm.; elytra .47 mm. long; abdomen .58 mm. × .57 mm.; total length approximately 1.25 mm. Brown, legs, palpi and antennal club lighter; vestiture fairly short, sparse, straight, somewhat appressed on appendages and elytra, apical setae of elytra noticeably longer; short hairs are represented weakly along with predominant long curved setae on head, pronotum and abdomen; gular area of head with dense, long setae. Head longer than wide; tempora rounded; prominent coarsely faceted eyes of approximately 18 facets slightly behind middle; two vertexal foveae separated by three times the distance from fovea to eye located behind anterior margin of eyes;

antennal tubercules moderately developed, gently rounded and barely disrupting the elliptical outline of the head; antennal club of three distinct segments; mandibular rami with five teeth; fourth segment of maxillary palpus with moderate cone but lacking other gross integumental structures; labrum subquadrate with two prominent apical sinuate structures; ventral surface of head medio-apically tumid with weak median carina extending a short distance basally; genal areas densely clothed with monaxial setae, some of which are longer than the majority. Pronotum with two basolateral and one mediobasal foveae, basal punctures weak; brachypterous; elytra with two small antebasal foveae; subhumeral fovea and epipleural sulcus absent. Mesosternum with median carina extending to anterior margin of mesocoxal cavities; abdomen with sixth ventral medianly emarginate with numerous minute tubercules surrounding the emargination; the seventh a subtriangular penal plate. Protrochanter with long tapering projection (fig. 20); metatrochanter with narrow curved flange (fig. 19). Genitalia as illustrated (fig. 3).

Female as in the male except: (1) small eyes of about seven facets; (2) only six sternites; (3) trochanters not armed; (4) tibia lacking spines.

This species is based on four males and seven females collected in Palm Canyon, Borrego State Park, San Diego County, California on April 25, 1955, by R. O. Schuster. The series was recovered from *Washingtonia filifera* debris. The holotype male and one paratype are deposited in the California Academy of Sciences, the remaining paratypes in the California Insect Survey.

In addition to the differing number of sternites and the trochanteral characters, the sex of a given specimen is easily determined by the deflection of the male abdomen opposed to the upward curvature of that of the female. The lone female of this species that was dissected was brachypterous.

The measurements of this species, as well as those following, were made as follows: Head width behind the eyes and not including eye facets; elytra along the suture; fourth segment of palpus excluding the cone; total length from front of head and not including antennae. All other measurements are the maximum possible.

The elliptically shaped head, resulting from the slight discontinuity of the antennal tubercules from the sides of the head, and the small metatibial spine are the only gross external characters allowing the separation of this species from its congeners. *Hesperotychus adustus* may be expected to occur in many of the isolated canyons in the area of Borrego State Park, particularly where *Washingtonia filifera* is found. Because of the disjunct nature of suitable habitats, numerous morphologically distinct populations are to be expected.

Hesperotychus claudus Schuster and Marsh, new species

(Fig. 4)

Male (slide). Head .29 mm. long × .28 mm. wide; pronotum .32 mm. × .35 mm.; elytra .52 mm. long; abdomen .51 mm. × .56 mm.; total length approximately 1.64 mm. Dark brown, elytra and extremities lighter; body pubescence moderately dense, long, suberect, that of appendages shorter, more appressed. Head scarcely longer than wide; tempora rounded; eyes of about 24 facets; vertexal foveae separated by three times the distance from fovea to eye, located on a line even with the front margin of the eyes; antennal tubercules moderate, discontinuous from head which is convergent and straight in front of eyes; mandibular rami with five or six teeth; tumosity and median carina of apical declivity well developed. Basal punctures of pronotum not apparent; apterous. Mesosternal carina long, extending over three-quarters the distance to the anterior margin of the coxal cavities; emargination of sixth ventral extremely slight, tubercules present. Protrochanter with moderately long projection; metatrochanter with narrow flange; protibia with large triangular subapical spine; metatibia not spined. Genitalia as illustrated (fig. 4).

Female. Unknown.

A single male was collected on the Ash Mountain Road, Sequoia National Park, Tulare County, California, on April 30, 1955, by H. R. Moffit and is deposited in the California Academy of Sciences.

The genital structure of this species is comparable to that of *H. adustus* in the large base and relative simplicity of the dorsal paramere. The moderate spine of the protrochanter and the narrow flange of the metatrochanter are common to both species. The antennal tubercules are more noticeably set off from the head than is the case in *H. adustus* and the metatibial spine of *H. claudus* seems to be obsolete.

Hesperotychus nanus Schuster and Marsh, new species

(Figs. 5, 21)

Male (slide). Head .28 mm. long × .27 mm. wide; pronotum .33 mm. × .36 mm.; elytra .51 mm. long; abdomen .61 mm. × .60 mm.; total length approximately 1.56 mm. Red-brown, elytra, legs and palpi slightly lighter; pubescence of extremities short, sub-appressed, longer hairs of body somewhat curved. Head longer than wide; tempora rounded; eyes of about 12 facets; vertexal foveae separated by approximately three times the distance from fovea to eye, located on line slightly anterior to margin of eyes; antennal tubercules rounded, moderately distinct from side of head; mandibular rami not visible; tumosity and median carina of apical declivity moderately developed. Basal punctures of pronotum present; brachypterous. Mesosternal carina extending half the distance to the anterior margin of the coxal cavities; emargination of sixth ventral weak, surrounding tubercules few in number. Protrochanter with fairly long, straight spine; meta-

trochanter with short, thin flange (fig. 21); pro- and metatibia not spined. Genitalia as illustrated (fig. 5).

Female. Unknown.

This species is known from one male, the holotype, collected from leaf mold at DAVIS, YOLO COUNTY, CALIFORNIA on April 10, 1950, by W. J. Wall and is deposited in the California Academy of Sciences. One female, not a paratype, considered as probably belonging to this species is so labeled in the University of California at Davis collection.

If the size of the eyes and number of facets are not variable in this genus, this species can be separated from the others considered in this paper by the small number of eye facets. The characters of the male genital structure in addition to the modification of the trochanter and the unspined metatibia show the affinity of this species to the preceding. These same structures are also the most useful in the discernment of these species.

Hesperotychus aspersus Schuster and Marsh, new species

(Figs. 6, 18, 22, 23)

Male (slide). Head .31 mm. long × .31 mm. wide; pronotum .35 mm. × .36 mm.; elytra .61 mm. long; abdomen not measurable; total length approximately 1.8 mm. Brown, elytra and extremities lighter; pubescence longer on body parts, shorter on legs and elytral disc; hair of metatibia suberect. Head as long as wide; tempora nearly straight; eyes of about 30 facets; vertexal foveae obsolete; antennal tubercules rounded-angulate, not prominent; mandibular rami not visible; tumosity of apical declivity weak; median carina obsolete. Pronotum with basal punctures; winged. Mesosternal carina extending half the distance to the anterior margin of the coxal cavities; median emargination of sixth ventral nearly obsolete, tubercules present. Protrochanter with long thin straight projection (fig. 23); metatrochanter with moderate thin flange (fig. 22); protibia with apical triangular spine (fig. 18); metatibia spined. Genitalia as illustrated (fig. 6).

Female. Unknown.

This species is known from one male, the holotype, collected 2 MILES EAST OF MORGAN HILL, SANTA CLARA COUNTY, CALIFORNIA, on February 3, 1953, by J. D. Lattin and is deposited in the California Academy of Sciences.

This species is allied to all of the preceding on the basis of the trochanteral modifications. However, the absence of vertexal foveae is shared only by species in which the metatrochanter possesses an extremely long, thin spine.

Hesperotychus moratus Schuster and Marsh, new species

(Fig. 7)

Male (slide). Head .31 mm. long × .30 mm. wide; pronotum .35 mm.

× .38 mm.; elytra .61 mm. long; abdomen .69 mm. × .61 mm.; total length approximately 1.75 mm. Black; body pubescence moderately dense, long, suberect, that of appendages shorter, more appressed; head longer than wide; tempora somewhat angulate; eyes of about 28 facets; vertexal foveae separated by three times distance from fovea to eye located in front of anterior margin of eyes; antennal tubercules rounded, moderately discontinuous from head; mandibular rami with six teeth; tumosity of apical declivity moderate, median carina broad but weak. Pronotum with basal punctures; winged. Mesosternal carina short, extending less than one-half the distance to the anterior margin of the coxal cavities; sixth ventral with moderate emargination and tubercules. Protrochanter with short blunt projection; metatrochanter with narrow curved flange; protibia with small subapical spine; metatibia with moderate subtriangular spine. Genitalia as illustrated (fig. 7).

Female. Unknown.

The type series is composed of three males collected at MENDOCINO, MENDOCINO COUNTY, CALIFORNIA, by J. R. Helfer on the following dates: November 10, 1954 (holotype), February 12, 1955 and March 6, 1955. The holotype male is deposited in the California Academy of Sciences, two paratypes in the collection of the California Insect Survey.

This is the only species with a narrow metatrochanteral flange in which the body color is black. While this character may be of some value in older specimens, fresher material will presumably be some shade of brown and the male genital structure should be used in making determinations.

HESPEROTYCHUS HEXAGONUS (Casey), new combination

(Fig. 8)

Tychus hexagonus Casey 1897, Coleopterological Notices, VII. Ann. New York Acad. Sci., pp. 616–617.

This species, described from a male, should be placed in *Hesperotychus* on the basis of the trochanteral modifications and the asymmetric genital structure (fig. 8). The type, USNM 38740, was collected March 8, 1892, at Ojai, Ventura County, California.

Hesperotychus fenyesi Schuster and Marsh, new species

(Figs. 9, 16, 24, 25)

Male (slide). Head .34 mm. long × .27 mm. wide; pronotum .35 mm. × .36 mm.; elytra .61 mm. long; abdomen .56 mm. × .63 mm.; total length approximately 1.6 mm. Red-brown; dual nature of pubescence pronounced particularly on extremities where the longer hairs are recurved, the shorter appressed. Head longer than wide; tempora somewhat angulate; eyes of about 24 facets; vertexal foveae separated by a distance over three times that from fovea to eye, located in front of anterior margin of eyes; antennal tubercules rounded, noticeably discontinuous from the sides of the head, which are straight and convergent in front of eyes; mandibular rami with

six teeth; tumosity and median carina of apical declivity present but narrow. Basal punctures of pronotum present; winged. Mesosternal carina ending well before the anterior margin of the mesocoxal cavities; tubercules around emargination of sixth ventral fairly noticeable. Protrochanter with short conical projection (fig. 25); metatrochanter with broad flange (fig. 24); protibia with small subapical spine; metatibia with moderate apical, triangular spine (fig. 16). Male genitalia as illustrated (fig. 9).

Female. Unknown.

The holotype and four paratype males are labeled "PASADENA, FEB., CALIF., A. Fenyes collection." Three additional male paratypes are labeled "Pasadena, Cal., Dr. A. Fenyes." The holotype male and four paratypes are deposited in the California Academy of Sciences, two paratypes in the California Insect Survey and one in the collection of Dr. Orlando Park.

In this species the metatrochanteral flange occupies nearly the entire posterior margin of the trochanter. The long recurved setae of the metatibia are not present in other species with this type of trochanteral modification.

Hesperotychus macclayi Schuster and Marsh, new species

(Figs. 10, 17, 26, 27)

Male (slide). Head .34 mm. long × .33 mm. wide; pronotum .38 mm. × .42 mm.; elytra .66 mm. long; abdomen .60 mm. × .62 mm.; total length approximately 1.8 mm. Black, elytra and extremities reddish; pubescence of body suberect, hair on legs short and appressed except those on the latrad surface of the metatibia. Head longer than wide; tempora gently rounded; eyes of about 30 facets; vertexal foveae separated by distance over three times that from fovea to eye; located in front of middle of eyes; antennal tubercules curved, therefore not too prominently separated from head; mandibular rami with six teeth; tumosity and carina of apical declivity moderately developed, winged. Pronotal punctures present. Mesosternal carina extending half way to the anterior margin of the coxal cavities; emargination of sixth ventral moderate, tubercules obscure. Protrochanter with short, blunt projection (fig. 27); metatrochanter with broad flange (fig. 26); protibia with small subapical spine 2/9 removed from apex; metatibial spine sharp, triangular (fig. 17). Genitalia as illustrated (fig. 10).

Female as in the male except: Only six sternites; trochanters not modified; metatibia lacking spine.

The type series is a collection of five males and twenty-five females by A. T. McClay at SEBASTOPOL, SONOMA COUNTY, CALIFORNIA, on April 9, 1936. Three specimens considered conspecific but not included in the type series, were collected at Forestville, Sonoma County, California, by A. T. McClay on the following dates: Male, female on May 17, 1937, a female on April 28, 1938. A male labeled "Alameda County, California, Van Dyke collec-

tion" also seems to belong to this species. The holotype is deposited in the California Academy of Sciences, five paratypes in the California Insect Survey, one paratype in the collection of Dr. Orlando Park, and the remaining paratypes in the collection of the University of California at Davis.

The trochanteral modifications are similar to those of *H. fenyesi*. However, the setae of the metatibia are uniformly long. The narrow genital structure would seem to ally this species more strongly to those following.

Hesperotychus aculeatus Schuster and Marsh, new species

(Fig. 11)

Male (slide). Head .30 mm. long × .30 mm. wide; pronotum .31 mm. × .35 mm.; elytra .56 mm. long; abdomen .69 mm. × .61 mm.; total length approximately 1.40 mm. Black, elytra and extremities light brown; pubescence of extremities uniform, longer hair of body relatively straight. Head as long as wide; tempora divergent, gently curved; eyes of about 25 facets; vertexal foveae not present; antennal tubercules rounded-angulate, moderately discontinuous from side of head; mandibular rami with five large teeth; tumosity of apical declivity weak and median carina obsolete. Basal punctures of pronotum present; winged. Mesosternal carina ending before the anterior margin of the coxal cavities; emargination of sixth ventral slight. Protrochanter with long thin spine curved from origin and straight distally; metatrochanter with long spine gently curved except for sharply recurved apex; protibia with small subapical spine; mesotibia with minute apical spine; metatibial spine long, thin, set at about a 45° angle from tibia. Genitalia as illustrated (fig. 11).

Female as in the male but differing in the following respects: Only six sternites, condition of wings not known; trochanters not modified; tibia lacking spines.

The type series was collected at DAVIS, YOLO COUNTY, CALIFORNIA, by A. T. McClay, on the following dates: Male (holotype), female, March 9, 1955; male, March 13, 1955; and male, March 14, 1955. The holotype male is deposited in the California Academy of Sciences, one paratype in the California Insect Survey, and the remaining paratypes in the collection of the University of California at Davis.

The exceptionally long projections of both the pro- and metatrochanter serve to distinguish this species, even when point-

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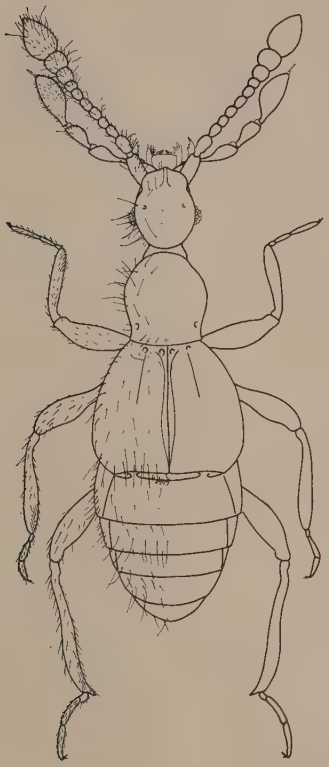
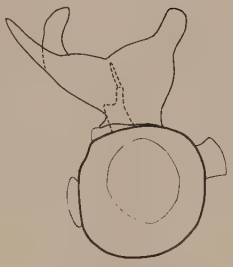
EXPLANATION OF FIGURES

Fig. 1, dorsal aspect of male. Fig 2, maxillary palpus. Figs. 3–13, dorsal aspects of mole genitalis. Figs. 14–17, apices of male metatibiae. Fig. 18, apex of male protibia. Figs. 19, 21, 22, 24, 26, 28, male metatrochanters. Figs. 20, 23, 25, 27, 29, male protrochanters.

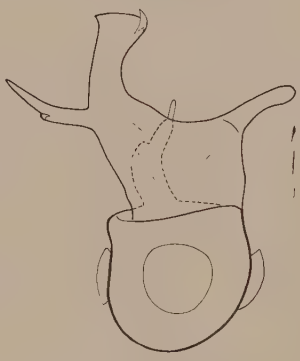


1 adustus

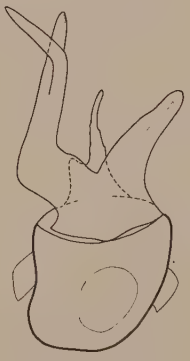
2 adustus



3 adustus

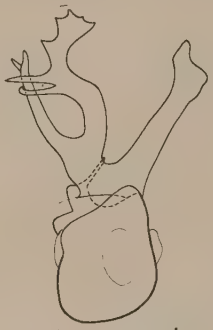


4 claudus



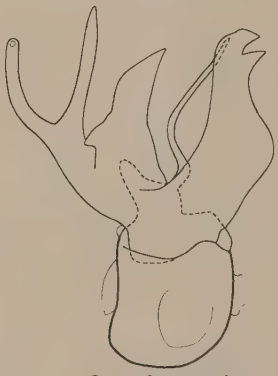
5 nanus

6 aspersus



7 moratus

8 hexagonus



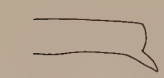
9 fenyesi

10 mcclayi

11 aculeatus

12 tantillus

13 Tychus niger



14 tantillus

15 adustus

16 fenyesi

17 mcclayi

18 aspersus

19 adustus

20

21 nanus

22 aspersus

23

24 fenyesi

25

26 mcclayi

27

28 tantillus

29

mounted, from other species occurring in central California. The two larger setae occurring on the metatrochanter proper in the other species are to be found near the apex of the projection in *H. aculeatus*. Vertexal foveae are obsolete, the tentoria abortive and not connected to the dorsal surface of the head capsule.

This species is closely related to the following and the variation is considered in the discussion of that species.

Hesperotychus tantillus Schuster and Marsh, new species

(Figs. 12, 14, 28, 29)

Male (slide). Head .29 mm. long × .27 mm. wide; pronotum .30 mm. × .33 mm.; elytra .53 mm. long; abdomen .59 mm. × .55 mm.; total length approximately 1.25 mm. Brown, elytra and appendages lighter; pubescence of extremities uniform; longer hair of body relatively straight. Head longer than wide; tempora gently curved; eyes of about 30 facets; vertexal foveae not present; antennal tubercules rounded-angulate; mandibular rami with five teeth; tumosity of apical declivity weak; median carina very faint. Basal punctures of pronotum present; winged. Mesosternal carina very short, extending about one-third the distance to the anterior margin of the mesocoxal cavities; protrochanter (fig. 29), metatrochanter (fig. 28) and metatibia (fig. 14) as in *H. aculeatus*; mesotibia with minute apical spine. Genitalia as illustrated (fig. 12).

This species is known from two males labeled "PASADENA, CAL., Dr. A. Fenyes." The holotype male is deposited in the California Academy of Sciences, the paratype in the California Insect Survey.

The principal differences between this species and *H. aculeatus* are the lighter color, a few more eye facets, a shorter mesosternal carina, and minor genitalic variation evidenced mainly in the left side of the dorsal paramere. When specimens become available from other localities and in sufficient numbers to allow determination of the range of morphological variability, the status of this species should be reconsidered.

The authors have not seen the types of *Tychus tenellus* LeConte or *Tychus micropthalmus* Brendel, but from the species descriptions, believe them to belong in *Hesperotychus*.

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BOOK NOTICE

MOSQUITOES OF NORTH AMERICA (NORTH OF MEXICO). By Stanley J. Carpenter and Walter J. LaCasse. viii+360 pp., 288 text figs., 127 pls. Berkeley and Los Angeles: The University of California Press. June 20, 1955. Price $10.00.

The first 24 pages contain sections on life history, collecting, preparing specimens for study, external anatomy (of all stages), and the internal anatomy of the female mosquito. Pages 25–329 comprise the taxonomic section, 331–353 a numbered bibliography of 770 items, 355–360 the systematic index. Each plate illustrates an adult mosquito, from a drawing by one of three Japanese artists.

Keys to the subfamilies, and for the tribes of Culicinae, are for adults, pupae and larvae; keys to the species of the various genera are usually to adult females, male terminalia, and fourth instar larvae; characters for the subgenera are included in the keys to adult females. The species treatments are arranged alphabetically under subgenera or genera; this obscures phylogenetic relationships, but is excellent for quick reference. The many plates must have added a great deal to the cost of publication, but will not be nearly as much used as the very good text figures.—HUGH B. LEECH, *California Academy of Sciences, San Francisco.*

RECENT PUBLICATIONS

The following five items appeared in the series "Bulletin of the California Insect Survey," published by the University of California Press, Berkeley and Los Angeles:

CALIFORNIA WASPS OF THE GENUS OXYBELUS (Hymenoptera: Sphecidae, Crabroninae). By Richard M. Bohart and Evert I. Schlinger. Vol. 4, No. 4, frontispiece+pp. 103–142, incl. pls. 9–16 and 23 text maps. April 11, 1957. Price 75 cents.

Despite the restrictive title this paper will be useful throughout the continent. It contains a key to the genera of Oxybelini of North America, and one to the species of *Oxybelus* in America [*sic!*] and northern Mexico.

THE THRIPS OF CALIFORNIA. PART I: SUBORDER TEREBRANTIA. By Stanley F. Bailey. Vol. 4, No. 5, pp. 143–220, incl. pls. 17–23. April 12, 1957. Price $1.50.

This paper gives keys to the world species of *Ankothrips, Erythrothrips, Orothrips* and *Stomatothrips;* to the known species of *Dactuliothrips, Leucothrips* and *Rhipidothrips;* to the North American species of *Aeolothrips, Bregmatothrips, Heterothrips, Linothrips, Scirtothrips* and *Scolothrips;* only the California species of other genera are included.

THE TYPICAL MUSCID FLIES OF CALIFORNIA (Diptera:Muscidae, Muscinae). By Bruce F. Eldrige and Maurice T. James. Vol. 6, No. 1, pp. 1–18, 4 text figs. (maps); pp. 14–17 are pls. 1–3 and explanations; p. 18 is blank. July 15, 1957. Price 50 cents.

This contains a short essay on the classification of the family Muscidae and the subfamily Muscinae; a key to the tribes of Muscinae, and one to both genera and species of the Muscinae of California, Oregon and Washington; distributional records, with notes on biologies.

THE CONOPID FLIES OF CALIFORNIA (Diptera). By Sidney Camras and Paul D. Hurd, Jr. Vol. 6, No. 2, frontispiece+pp. 19–50, 4 text figs., 25 maps. September 3, 1957. Price 75 cents.

Biological data; keys to the subfamilies, genera and species of California Conopidae, and to the California subgenera of *Physoconops;* synonymies and distributional records. As in some other papers in the series, species not yet reported from California, but to be expected, are included . . . in this case 7 species (and one in which a mislabeling is suspected), including the genus *Robertsonomyia.*

THE EMBIOPTERA OF CALIFORNIA. By Edward S. Ross. Vol. 6, No. 3, frontispiece+pp. 51–58, 7 text figs. September 3, 1957. Price 50 cents.

Bionomics; key to the California species of Embioptera (any instar); distributional records and discussion of the three species, only one of which is native.—HUGH B. LEECH, *California Academy of Sciences, San Francisco.*

A NEW GENUS OF BRACHYCISTIDINE WASPS

(Hymenoptera: Tiphiidae)

MARIUS S. WASBAUER
University of California, Berkeley

In the course of preliminary investigations on the North American Brachycistidinae, the author has had to depend heavily on various collections of Mexican material for purposes of establishing generic relationships within the subfamily which is primarily Austral in distribution.

Early in 1955, a series of very large, robust specimens from Lower California came to my attention. Because of their unique combination of characteristics, they were set aside as representing a posible new genus. Later, a group of species occurring in the United States and referable to *Brachycistis,* as currently understood, was found to share many of the same morphological traits. Comparison of these species with other known brachycistidines, clearly indicates the necessity for their inclusion in a separate genus.

Acanthetropis Wasbauer, new genus

Male.—Head rounded, broader than long; ocelli enlarged; compound eyes slightly convergent below, inner margins broadly emarginate; antennal socket with broad carina or thickening beneath; clypeus transverse, central portion slightly convex, with a narrow, apically projecting ledge; mandibles tridentate, a weakly developed carina extending from mandibular base to a point just proximad of innermost tooth, the carina obsolescent near its middle, strongly produced distally, forming a ridge or low dentiform process which is minutely striate on upper surface; maxillary and labial palpi well developed and conspicuous. *Thorax* robust, moderately long; pronotum narrow, tranverse, nearly vertical, humeral angles rounded, not prominent; mesonotum with parapsidal furrows long, strongly impressed; mesepisternum carinately produced or with a low, rounded protuberance anterodorsally, not evenly convex. Propodeum with a dorsal median longitudinal sulcus, area laterad of sulcus raised, sloping off more or less abruptly posteriorly, dorsal, lateral and posterior faces seperated by a strong carina which margins entire propodeum dorsally. Coxae simple, not carinate. Wings long, venation well developed; forewing with three submarginal and three discoidal cells, third submarginal cell two-thirds or more the length of the second, first transverse cubital vein arising beyond basal third of first submarginal cell; marginal cell elongate, the costa extending distad of stigma for a distance greater than half the length of stigma. Hind wing with radial and cubital veins well developed, cubitus arcuate, forming an angle with transverse cubital of less than 135 degrees, jugal lobe much shorter than submedian cell. First metasomal segment considerably narrower than second in dorsal aspect, the sternum with median sulcus expanded posteriorly into

a broad concavity; second metasomal sternum with a strong, basal, median, logitudinal carina. Digitus of genitalia sagittate at apex, without a long, lanceolate process extending apically; valsellar plate with a number of long, stout spines on mesal surface.

Female.—Unknown.

Type of genus: *Acanthetropis lamellatus* Wasbauer, new species.

The genus *Acanthetropis* is separable from all other known brachycistidine genera by the very long marginal cell of the forewing, excavated first metasomal sternum and longitudinally carinate second sternum. Its closest affinities are probably with the genus *Colocistis* Krombein with which it shares the transverse carina of the propodeum, anterodorsal protuberance of the mesepisternum, ornamentation of the second metasomal sternum, short digitus and large size.

Acanthetropis lamellatus Wasbauer, new species

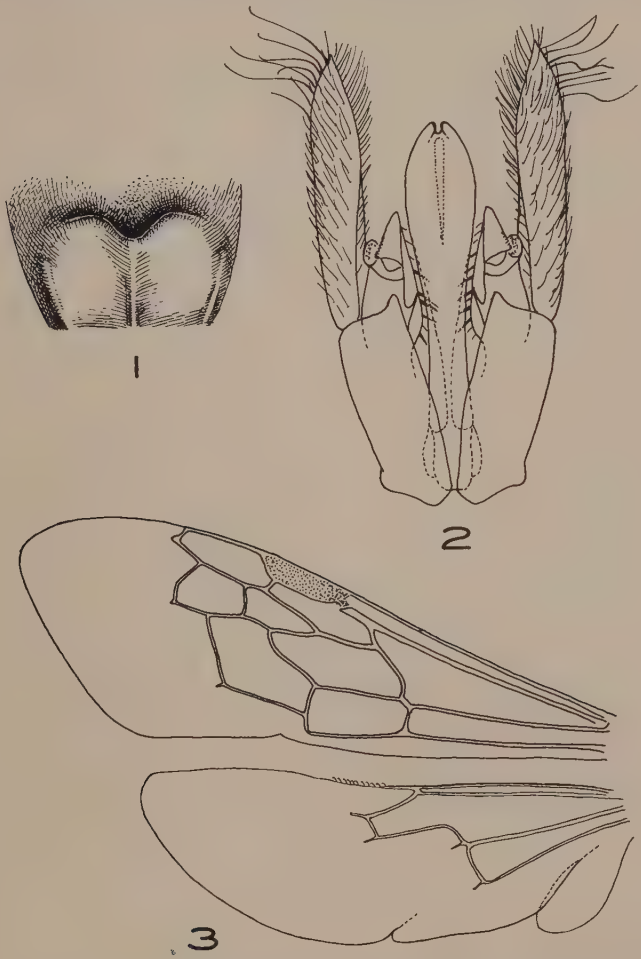
Male.—Dark mahogany brown, posterior metasomal segments slightly darker, antennae and legs amber yellow, tips of mandibles piceous. Vestiture shining white or faintly yellowish. *Head* very broad, length (measured from a line drawn across tops of lateral ocelli to apex of clypeus) .68 the width. Face shining with a few small scatered punctures, stronger between lateral ocelli and on occiput. Antennae moderately long, scape with a few long, erect hairs ventrally, flagellum sparsely clothed with minute appressed whitish pubescence, length of first flagellar segment 3.1 its greatest width. Lower rim of antennal socket not sharp or carinate below. Basal half of clypeus shining, impunctate, apical half with a number of irregularly spaced, broad, shallow punctures and long apically directed hairs. Gular carina not strongly elevated anteriorly, not visible below mandibular condyle in lateral aspect. Mandibles with a number of long, stout, amber-colored hairs on outer surface. *Thorax* strongly punctured, sparsely clothed with medium to long, erect or suberect hairs; anterior face of pronotum shining medially, nearly impunctate, lateral faces strongly punctate. Mesonotum with punctures smaller, more closely set anteriorly; mesepisternum with a strongly raised, ridge-like elevation below anterodorsal protuberance; propodeum with the dorsal sulcus strongly impressed, shining, raised area laterad of sulcus finely reticulate, impunctate except for small lateral area, posterior declivity sharp, carinate, area between declivity and posterior transverse carina smooth, shining; posterior face separated from lateral face by lateral diagonal carina meeting posterior carina dorsally, obsolete before posterior rim. Wings as illustrated (fig. 3). First metasomal segment short, stout, second metasomal sternum with basal carina broad, terminating at a raised, transverse lamella (fig. 1). Genitalia (fig. 2) with aedeagus gradually expanded before apex.

Female.—Unknown.

Length 14 (11–14) mm.

Holotype male and eleven paratypes, La Paz, Lower Cali-

FORNIA, October 7, 1941 (Ross and Bohart); seven paratypes, fifteen miles north San Ignacio, Lower California, June 24 to 27, 1938 (Michelbacher and Ross); six paratypes, fourteen miles



EXPLANATION OF FIGURES

Acanthetropis lamellatus Wasbauer, new species. Fig. 1, basal portion of second metasomal sternum. Fig. 2, male genitalia, dorsal aspect. Fig. 3, wings (drawn from paratype).

south El Arco Mine, Lower California, June 23, 1938 (Michelbacher and Ross). The holotype and eleven paratypes have been deposited in the collection of the California Academy of Sciences, six paratypes with the California Insect Survey and seven paratypes with the U.S. National Museum.

In addition to the species described above, the following should be placed in the genus *Acanthetropis: Brachycistis idiotes* Cockerell, *B. noctivaga* Bradley, *B. normalis* Bradley and *B. aequalis* Fox (new combinations).

NESTING HABIT AND PREY RECORD OF HARPACTOSTIGMA (ARCESILAS) LAMINIFERUM (FOX)

(Hymenoptera:Sphecidae)

On July 2, 1957, while collecting along a highway cut above the Salmon River approximately three miles southeast of Whitebird, Idaho County, Idaho, the writer observed a single female of *Harpactostigma (Arcesilas) laminiferum* (Fox) (det. K. V. Krombein) in flight transporting an unidentified prey. The wasp alighted on the vertical face of a clay bank and entered a small crack. This crack was carefully enlarged and near the bottom a tunnel opening approximately one-quarter inch in diameter was found. While the tunnel was being exposed the wasp appeared and was captured. Further excavation revealed the tunnel to be approximately seven inches long, extending downward for most of its length then curving to the right and terminating in a cell about twice the tunnel diameter.

Within the cell were five nymphal and one adult *Scolops*. Unfortunately, the adult Fulgorid was not intact, and it and the nymphs could be recognized only to genus. However, from comparisons with identified material known or likely to occur in Idaho the specimens appeared to be *Scolops hesperius* Uhler, according to Richard C. Froeschner.

Since the adult *Scolops* was found in a damaged condition lacking head, prothorax, and some appendages even in the absence of larvae of *H. laminiferum* the use of adult *Scolops* as prey by this wasp is questionable. However, the presence in the nest of five *Scolops* nymphs, apparently paralyzed but otherwise in good condition, serves as a valid prey record.

The above note is significant since, to the writer's knowledge, this represents the first record of prey preference by a member of this genus.—ARTHUR R. GITTINS. *University of Idaho, Moscow.*

A NEW SPECIES OF THE GENUS COLLETES FROM THE COLORADO DESERT OF CALIFORNIA

(Hymenoptera: Apoidea)

P. H. TIMBERLAKE

Citrus Experiment Station, University of California, Riverside

A fine new species of *Colletes* was collected near Hopkins Well, about 18 miles west of Blythe, Riverside County, California, April 28–29, 1952, where one female was taken by Paul D. Hurd, Jr., and one male by J. G. Rozen. In 1958 the locality was revisited and many specimens of this bee were collected at flowers of *Larrea* and at the nesting site during the period of April 13 to 18 by J. A. Powell, P. D. Hurd, J. W. MacSwain, E. G. Linsley and the author. Subsequently Dr. Hurd discovered five specimens in the California Insect Survey collection which had been taken with *Martinapis* at flowers of *Cercidium* on April 22, 1950, near Indio by E. G. Linsley and J. W. MacSwain.

Colletes stepheni Timberlake, new species

This new species is remarkable for its large size, morphological characters and its habits. The male runs in Stephen's table (1954, Univ. Kans. Sci. Bull., 36:174–201) to *prosopidis*, but differs from that species and the related *algarobiae* and *deserticola* in its much larger size and by having the first joint of the flagellum more than twice as long as the pedicel, the ocelli very large, the pubescence of the head and thorax unusually dense and the clypeus much more prominent. The female runs to *salicicola* but differs in its large size, prominent clypeus, large ocelli and by having a well-defined and finely rugose pygidial plate.

It is a pleasure to name this very distinct species of the *daleae* group in honor of W. P. Stephen, who has given us an excellent revision of the North American species of the genus *Colletes*.

Male.—Black, the apex of tergite 7 reddened and the apical segment of venter mainly ferruginous. Apex of all tibiae reddened and the tarsi ferruginous. Flagellum of antennae ferruginous in large part, but the first joint entirely dark and the following four or five joints becoming successively less blackened on the upper side only. Apex of mandibles reddened. Tegulae amber color. Wings faintly smoky hyaline, the nervures testaceous brown, the subcosta black.

Head broad, the eyes strongly diverging above. Ocelli somewhat greater in diameter than the thickness of antennal scapes. Clypeus prominent, strongly elevated and rather abruptly declivous on each side and at base. Labrum bulbously convex at base. Malar space as long as wide. Antennae long, the first joint of flagellum twice as long as the pedicel and somewhat

shorter than the second joint, which with following joints is twice as long as thick. Spines of prothorax obsolete. Face densely and minutely punctured, the punctures becoming sparse and faint on exposed parts of vertex. Clypeus polished, medially sulcate and moderately closely and finely punctured. Thorax minutely and closely punctured, the punctures of the mesopleura somewhat coarser and closer than those of mesoscutum. Basal area of propodeum entirely smooth and shining, or sometimes with fine oblique rugae on each side of the base. Abdomen dullish, with dense microscopic setigerous punctures. Tergite 7 narrowed to the rounded apex, nude and finely rugose on disk. Pubescence long, dense, plumose and white on head and thorax, but clypeus nearly nude, although partially covered by the long pendant hairs from sides of face and supraclypeal region; hair of thorax above tinged with ochreous. Abdomen with dense white hair bands at apex of tergites 1 to 5, the hair on tergite 6 and sides of tergite 7 comparatively thin; hair on disk of tergite 1 long, thin and white, but somewhat denser on the lateral margins; hair on disk of tergites 2 to 5 fine, depressed, mostly very short, but becoming longer and more erect on tergites 4 to 6. Seventh ventral plates subquadrate, moderately widened and truncate at apex, each with a slight fold on the middle of the apical margin; outer apical corner of each plate rounded, with moderately long dense hair, and the commisural margin with fine short hair. Parameral appendage of stipites small, about one and one-half times longer than wide and rounded at apex; volsellae massive; lateral wings of sagittae testaceous, moderately wide and widest at their middle; dorsal wings absent. Length, 9.5–13 mm.; anterior wing, 7–8.5 mm.

Female.—Black, the pygidial plate rufescent, and the apical ventrite more or less and irregularly reddened; apical margin of the ventral segments 2 to 5 narrowly whitish hyaline. Apical two-thirds of mandibles and middle of labrum tinged with dark red. Legs black, the small joints of tarsi ferruginous, the claws piceous in apical half, and the tibial spurs testaceous. Antennae black from base of scape to the second or third joint of flagellum, thence becoming more ferruginous above toward apex, and ferruginous beneath from apex nearly to base of second joint of flagellum. Tegulae amber color. Wings faintly dusky hyaline, becoming more definitely dusky in apical field; nervures and stigma testaceous brown, the nervures except the black subcosta more ferruginous toward base of wing.

Head broader than long, with eyes strongly divergent above. Ocelli large, distinctly greater in diameter than greatest thickness of antennal scapes, the posterior pair less than one-half of their diameter from occipital margin of vertex. Facial fovea obscured by pubescence, but broad and rounded at posterior end. Malar space about one half as long as wide. Clypeus strongly elevated, prominent and with a medium sulcus. Mandibles obtuse at apex, the inner tooth represented by the oblique narrowing of the inner margin. Prothorax without spines. Basal area of propodeum smooth, the basal pits weakly developed or more or less obsolete in middle. Tergite 6 with a distinct pygidial plate with converging sides and rounded apex, the disk finely rugose with some of the rugae irregularly longitudinal. Tarsal claws with a strong inner tooth. Antennae rather elongate, the flagellum cylindrical, with the middle joints nearly twice longer than thick,

the first joint longer than the second and more than twice as long as the pedicel. Pubescence dense, plumose and white, becoming ochreous on dorsum of thorax and tinged with ochreous in ocellar region of vertex. Hairs in the pits on apical margin of clypeus, and those fringing the mandibles and sides of tergite 6 golden ferruginous, and hair on inner side of tarsi bright ferruginous. Tergites 1 to 5 each with a broad white apical band, the disk of tergites with very fine and short depressed hair, not concealing the surface, except at base of tergite 2; base and sides of tergite 1 with long, rather thin white hair. Venter of abdomen with moderately short and dense hair which becomes denser at apex of segments and fringes the margin to form weak bands. Clypeus finely punctured, the punctures somewhat lengthened, moderately close on disk and sparse on the declivous sides. Face above clyeus and the thorax very finely and closely punctured, the puntures of mesoscutum about one to two puncture widths apart. Disk of first tergite before the band with extremely fine and moderately close punctures and exposed part of disk of following tergites with dense microscope punctures. Length, 13–15 mm.; anterior wing, 9–9.5 mm.

Holotype male and allotype female, 18 MILES WEST OF BLYTHE (HOPKINS WELL), RIVERSIDE COUNTY, CALIFORNIA, on *Larrea*, April 15, 1958 (Timberlake). Paratypes as follows: 5 females, Indio, Riverside County, on *Cercidium floridum*, April 22, 1950 (E. G. Linsley and J. W. MacSwain); 1 female, 1 male, 18 miles west of Blythe, the female on *Geraea canescens*, April 28, 1952, the male, April 29 (Hurd and Rozen); and 141 males, 102 females, 18 miles west of Blythe, April 13–18, on *Larrea divaricata*, except 110 males, some females taken at nesting site, some males asleep at night on dead grass stems (*Hilaria rigida*), and 1 pair taken at light (Timberlake, Powell, Hurd, MacSwain and Linsley).

BOOK NOTICE

FISHING WITH NATURAL INSECTS. An Angler's Guide to Useful and Interesting Information about Many Common Insects and a Few Imitation Lures that Fishermen use for Bait. By Alvah Peterson. x+176 pp., 63 figs., most of them compound. Columbus, Ohio. For sale by the author, Entomology Division, Ohio State University, Columbus 10, Ohio. 1956. Price $6.00.

The subtitle is a fair description of the text. It is essentially a how-to-do-it book for anglers, who will read a good deal of entomology while searching for the particular bit they want. The factual information is accurate, but by simplifying for non-technical readers Dr. Peterson has made some generalizations which will bother the critical entomologist. The drawings are nearly all good. The photographic illustrations vary from excellent to very poor; many of them have been so heavily retouched that they no longer resemble photographs. The book could have been shortened and the text improved by stricter editing. — HUGH B. LEECH, *California Academy of Sciences, San Francisco.*

HYPERISUS MARGINICOLLIS (LECONTE) A NEW COMBINATION

(Coleoptera:Anobiidae)

HERBERT RUCKES, JR.
University of California, Berkeley

During recent studies of the genitalia of the Anobiidae, the author found that the male and female genitalia of *Hyperisus plumbeum* Mulsant and Rey were almost identical to the genitalia of *Ernobius marginicollis* (LeConte) and unlike any other of the genitalia examined. It has been indicated earlier (Ruckes, 1957) that *E. marginicollis* does not belong in the genus *Ernobius*. The biology of *marginicollis* is entirely different from the species of *Ernobius*. All host records of *Ernobius* indicate that this genus is restricted to the conifers, the larvae being reared from the stems, cones and under the bark of these hosts. *E. marginicollis* has been reared, according to all host labels examined, from the stems of lupine and from "weeds."

After the examination of a long series of *marginicollis* it was noted that the front coxae are only moderately prominent and are separated by a distinct posternal process and the prosternum is long before the coxae; these characters alone will remove the species from the genus *Ernobius*.

HYPERISUS MARGINICOLLIS (LeConte), new combination

Dark brown to black, elongate. Head, pronotum and elytra with long recumbent pubescence intermixed with short erect hairs. Antennae eleven segmented, male with ninth segment longer than preceding five united, female with ninth segment slightly longer than preceding three united. Palpi with terminal segments fusiform, being widest at or behind the middle. Tarsi relatively narrow. Front coxae only moderately prominent, separated by a distinct prosternal process. Prosternum long before the coxae, being more than half the coxal diameter from front to back. Sides of pronotum margined and serrulate.

REFERENCES CITED

RUCKES, HERBERT, JR.
1957. A synopsis of the California deathwatch beetles of the genus *Ernobius* Thomson, with descriptions of two new species which attack pine cones. Pan-Pacific Ent., 33(4):157–161.

OBSERVATIONS ON THE NESTING HABITS OF COLLETES STEPHENI TIMBERLAKE

(Hymenoptera: Apoidea)

PAUL D. HURD, JR. AND JERRY A. POWELL
University of California, Berkeley

During the past several spring seasons field parties of the California Insect Survey have made repeated attempts, while collecting on the Colorado Desert of California, to obtain a series of an undescribed bee, the largest *Colletes* known to occur in America north of Mexico. The bee was first recognized from two specimens collected in April, 1952, near Hopkins Well, some 18 miles west of Blythe, Riverside County, California. It was, therefore, one of the goals of a return trip to Hopkins Well this year to secure a series sufficiently large enough to permit characterization of the species. The bee, *Colletes stepheni*, is described in an accompanying paper by P. H. Timberlake (1958), for it was our good fortune not only to collect an adequate series, but also to discover an extensive nesting site.

The nesting area, which was studied April 14 to 17, 1958, is located on the prominent, drifting sand dunes immediately south of U.S. Highway 60–70 just to the east of Hopkins Well, Riverside County, California. The site extended in an arc, some 12 yards in width for approximately 170 yards on the north and west facing slopes of the curving dunes. Within this zone most of the burrows were localized into six principal groups consisting of 39, 28, 22, 22, 15 and 12 burrows. The entire nesting area probably had some 200 burrows active at that time. The drifting sand dunes in the area occupied by the nests are partially held in place by scattered bushes of two predominant perennial plants,[1] Creosote Bush (*Larrea divaricata* Cav.), and a tall dry, clumped grass with the culms 2 to 3 feet in height known as Galleta (*Hilaria rigida* (Thurb.) Benth.). Unusually heavy rains of the preceding winter occasioned a profusion of annual growth consisting promarily of *Oenothera deltoides* Torr. & Frem. and *Psilostrophe cooperi* (Gray) Greene, which also aided in the stabilization of the dune surfaces.

The nests were grouped in unvegetated areas with the range of distance between burrows being about 15 cm. to three meters. The most evident feature of the burrow, which is plugged during

[1] The plant identifications used in this paper were made by Helen K. Sharsmith, University of California Herbarium, Berkeley.

most of the day, is the large and distinctive tumulus that is formed on the downward slope below each nest entrance. As will be noted in the illustration (fig. 1), the fan-shaped mound rather resembles the tailings of a mine shaft.

The nesting area was first discovered late one afternoon when large numbers of the males were seen coursing with an audible hum over the closed burrows. On the subsequent day (April 15) the sequence of this late afternoon flight was observed. The first male was seen at 4:59 p.m. (Pacific Standard Time) and by 5:15 p.m. the main flight had commenced. At this time 20 to 30 males were coursing, some two or three inches above the sand, over one group of nests in an area of approximately 200 square yards. This activity was evident over the entire nesting area. The concentration of individuals continued to increase until by 5:30 p.m. the audible hum was evident. From this time until the sun dropped below the horizon at 5:58 p.m. the flight gradually diminished, continuing to do so through the period of twilight. The last active male was observed at 6:21 p.m., well before dark. At the conclusion of their flight the individuals dispersed to nearby vegetation for the night. Large numbers of them were discovered sleeping on the tall seasoned culms of the Galleta grass where nearly all individuals rested in a head down position clinging with their legs. It is not known whether this was a preferred resting site, but males were not found sleeping elsewhere.

During the main flight occasional small groups (3–6) of males were frequently congregating on the sand, scratching or attempting to dig, tumbling and struggling with one another using their mandibles and legs. Some were seen scratching at the burrow entrance plugs. Often individuals entered depressions in the sand or burrow-like holes and bumped various objects lying about the nesting site, such as small dark plant fragments, an empty wasp cocoon, and frass pellets of the sphinx moth, *Celerio lineata* Linnaeus. One male pounced on a small tenebrionid beetle (*Blapstinus* sp.) as it crawled through the nesting site. Perhaps the most remarkable observation was that involving the males' activity about a dead adult female andrenid bee, *Andrena rozeni* Linsley and MacSwain,[2] lying on the surface of the sand. The dead *Andrena* was repeatedly tumbled by the *Colletes* males, and several males each in turn attempted to copulate with it by

[2] Determined by E. G. Linsley and J. W. MacSwain, University of California, Berkeley.

climbing upon its back and actually extruding the genitalia in contact with the tip of the dead female's abdomen.

It is assumed that the purpose of this evening flight is that of seeking out and copulating with the females as they open their burrows. The one copulation that was observed occurred at 6:03 p.m. when several frenzied males were seen at a burrow tumulus where a female was unplugging her burrow. The female was dragged out by two or three struggling males, one of which apparently successfully managed to copulate with her. Almost immediately the other males left, and after several seconds the pair separated, probably due to the intervention of the observer. For some reason, possibly the stage of the nesting activity of the colony, almost no females opened their burrows during the male flight. It would appear likely that females requiring copulation must unplug their burrows while this evening male flight is in progress. However, during the period of observations, nearly all

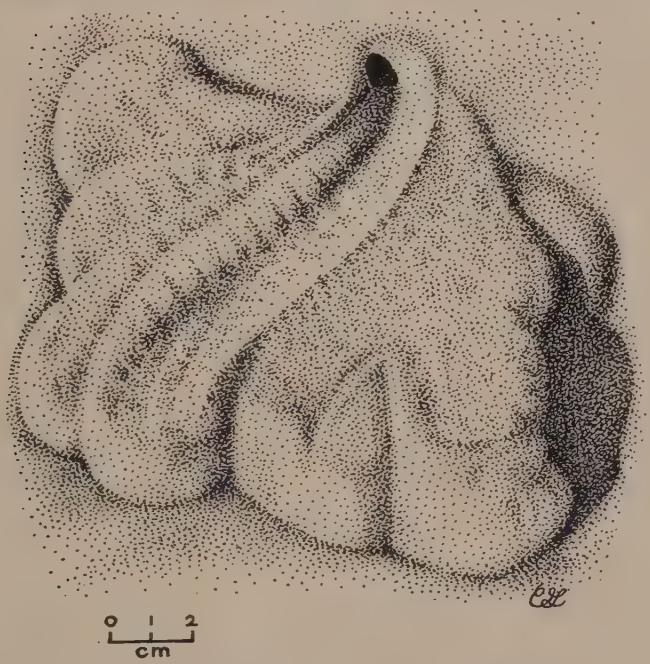


Fig. 1—Burrow tumulus of *Colletes stepheni* Timberlake.

the burrows remained closed for about an hour after the end of the male flight.

Observations revealed that the excavation of the burrows by the females was carried out during the night with the first individual engaged in this activity having been seen at about 7:14 p.m., well after dark. More females continued to open burrows and commence digging as the evening progressed. By 8:00 p.m. 10–20 per cent had begun work, and by 10:30 p.m. the majority of the burrows were unplugged with their occupants active. The digging process was continuous until at least 11:30 p.m., when our investigations were postponed for the night. Observations were suspended between the hours of 11:30 p.m. to 4:30 a.m. and it is not known how long the excavation continued.

On the basis of several bees observed, the digging process seemed to be relatively uniform in pattern. Following the gradual removal of the plug, the female was seen to always back out abdomen first, pushing the excavated sand with her abdomen and hind legs. After three or four trips to the surface, in which small loads of dry sand were deposited near the entrance, successively closer each time, the female backed completely out of the burrow and pushed the accumulation across the surface of the tumulus, forming a depressed trackway (fig. 1). When the pushed sand reached the periphery of the tumulus, it cascaded from the end of the trackway, adding to the steep outer margin of the tailings. This trackway, during the course of an evening's digging, was shifted from side to side across the surface of the tumulus. As the bee backed out, the trackway assumed a characteristic reticulated appearance due to a curious oscillating of the abdomen and legs.

Upon revisiting the nesting site before dawn (4:40 a.m., April 17) the burrows were open. It seems likely that they remained open all night. We assume from females seen by E. G. Linsley, J. W. MacSwain and P. H. Timberlake at the pollen source, Creosote Bush (*Larrea divaricata* Cav.) as early as 4:20 a.m. that the morning's provisioning had already begun. However, judging from activity at the burrows when we arrived and at the height of the provisioning period (5:00 a.m. to 6:30 a.m.) it is presumed that the pollen gathering had begun only shortly before. Since the first pollen-laden females were seen returning at 4:55 a.m. (just at sunup) we know that the first departures had already

occurred. Males were found still sleeping on the culms of Galleta while a few other males were flying about the general nesting area.

The time data obtained on the pollen collecting flights are tabulated in Table 1. The flights averaged about 20 minutes and ranged from 12 to 39 minutes. Much of this variation is attributable to differences between individuals, for example female *C* took longer than *A* or *D*. Females when leaving burrows hovered in a small arc a few inches above and downhill from the tumulus before departing. Returning females were seen to either enter without hesitation or to momentarily hover above the entrance before entering the burrow. The plugging was accomplished in stages usually requiring a number of trips to the surface by the female with excavated material. For example, one female which commenced plugging at 6:03 a.m. required seven trips to the surface before the entrance was closed externally at 6:17 a.m.

Table I—Departure (d) and arrival (a) times of pollen trips.
(Pacific Standard Time, A.M.)

observed female	d	a	d	a	d	a	d	a	burrow plugging completed
A.	4:51	5:08	?	5:23	5:26	5:38	?	6:00	7:04
B.	?	5:23	5:25	5:47	5:49	6:13	6:15	6:27	7:12
C.	?	5:15	5:17	5:47	5:49	6:19	6:22	6:47	7:11
D.	?	5:27	?	5:43	5:45	6:00	6:03	6:22	7:04
E.	?	5:31	5:33	6:12	—	—	—	—	6:58
F.	?	5:10	—	—	—	—	—	—	6:17
G.	?	5:29	?	5:46	5:49	6:07	—	—	7:21
H.	?	5:37	?	6:01	6:05	6:36	—	—	7:01

By 7:20 a.m. in one site under study, 21 of the 28 burrows were already plugged. All burrows were closed by 8:00 a.m. Reports from the floral source indicated that the morning activity of the males (nectar) and the females (nectar and pollen) had largely ceased by 6:20 a.m. Apart from the few males seen briefly about the nesting site before sunrise, no male activity comparable to the evening flight took place over the burrows. It is believed that the males spend the day in abandoned burrows or other holes in the dunes. This is suggested in part by their absence on the Galleta grass, as well as by numbers of males observed in one instance leaving an abandoned burrow in the evening.

The four burrows excavated for study showed a general similarity in configuration and depth. Individual variation was nonetheless evident in the degree and direction of lateral displace-

ment. The nests were initiated in a substrate consisting of unconsolidated dune sand to a depth of approximately 50 cm. Below this level existed a layer of hard-packed dune sand which when removed remained in consolidated chunks. A moisture layer commenced four or five cm. below the surface and extended about 45 cm., approximately to the upper level of the underlying compacted layer. This situation explains the dry sand being deposited at the surface by the females which were excavating below the moisture level. From the entrance the tunnel, which was about 7 mm. in diameter, progressed inwardly almost horizontal to the surface for about 15 cm. The initial portion of the nesting tube when plugged is filled with sand for about 8–10 cm. from the entrance. Following the horizontal portion the tunnel curved into a nearly vertical drop of 45–50 cm. At about this point the burrow angled away to either the right or left, continuing downward somewhat less steeply to a depth of about 75 cm. from the surface. The final section of the burrow varied considerably between individuals, but in general made a second steep drop before attaining the cell level. The fact that the exposed portion of the tunnel remained intact on the wall of our excavation indicates that the bee may have structurally supported the burrow by some means, but no lining was evident. One burrow successfully excavated was found to be still under construction. The female bee was found at the end of the nesting tube 130 cm. long, some 90 cm. below the surface of the dunes. In another case a single partially provisioned cell was located at the end of the burrow about 98 cm. beneath the dune surface. The apparently unlined cell contained a membranous cellophane-like capsule, provisioned with a viscous liquid mixture of *Larrea* pollen and nectar. No egg was found, however the cell had been partially damaged since the female had been forced backward into it during our digging operation. The tunnel in this instance was estimated to be 140 cm. long and had four angles of 35° to 45° during its course (alternating from sinistral to dextral).

During the course of our study three hymenopterous parasite species were observed in the nesting area. Two of these appeared to have a definite relationship with the bees under study. Nine females of a large undetermined *Sphaeropthalma* [*sensu* Schuster 1958][3] (Mutillidae) were collected crawling on the sand in the

[3] Determined by W. E. Ferguson, University of California, Berkeley.

nesting area between 7:20 p.m. and 8:10 p.m., and one of these was taken shortly after it came out of an open *Colletes* burrow. Extensive collecting during several evenings in other areas of the dunes failed to reveal its presence. Another mutillid, *Dasymutilla arenivaga* Mickel, although observed wandering through the nesting site, seems more likely to be associated with bembicine wasps nesting on the dunes. A large ferruginous and undetermined parasitic bee of the genus *Nomada* was seen to enter an open active burrow at 6:55 a.m. and remain within for about 20 seconds. The bee, a female, was collected on its reappearance.

Since *Colletes stepheni* Timberlake is itself so unique and exhibits so unique a nesting behavior, no attempt is made to compare it with any of its congeners. A summary relating to the bionomics of the genus has been provided by Stephen (1954: 155–163). The only North American species of the genus *Colletes* whose nesting habits have been previously reported upon in some detail is the eastern United States *C. inaequalis* Say.

Celeste Green, Scientific Illustrator, University of California, Berkeley, kindly prepared the accompanying figure from photographs taken at the nesting site.

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RECENTLY PUBLISHED

OBSERVATIONS ON THE HABITS OF STYLOPS PACIFICA BOHART. By E. G. Linsley and J. W. MacSwain. University of California Publications in Entomology, Vol. 11, No. 7, pp. 395–430, incl. pls. 51–53, 1 text fig. University of California Press, Berkeley and Los Angeles. April 30, 1957. Price 75 cents.

A fine paper in which some erroneous ideas are corrected and the subject clarified. The illustrations are excellent.

THE NEOTROPICAL SPECIES OF THE "SUBGENUS AESCHNA" SENSU SELYSII 1883 (Odonata). By Philip P. Calvert. Memoirs of the American Entomological Society No. 15. vi+251 pp., pls. I–XLVII; 19 tables, 7 maps, on un-numbered pp.; +i–iv [index]. American Entomological Society, Academy of Natural Sciences, Philadelphi. December 31, 1956. Price $10.00.

A thorough and meticulously annotated work, with full descriptions of the adults and the known larvae, ecological data, discussions, and investigation of the literature; this results from decades of study.

A SYNOPSIS OF HYMENOPTEROUS PARASITES OF MALACOSOMA IN CALIFORNIA (Lepidoptera, Lasiocampidae). By Robert L. Langston. University of California Publications in Entomology. Vol. 14, No. 1, pp. 1–50, 13 tables. University of California Press, Berkeley and Los Angeles. November 7, 1957. Price $1.00.

Gives descriptive notes on the adults and larvae of California species of *Malacosoma* with distribution and host records. Parasite recoveries are tabulated, and literature records noted.—HUGH B. LEECH, *California Academy of Sciences, San Francisco.*

BOOK NOTICE

TAXONOMIST'S GLOSSARY OF GENITALIA OF INSECTS. Edited by S. L. Tuxen. 284 pp., 215 text figs. Copenhagen: Ejnar Munksgaard. Late 1956. Price 80 Danish Kroner (about $12.75).

This exceedingly useful book is divided into two parts. Part I (pp. 19–174) contains descriptions of the genitalia, arranged by orders (following Grassé), and as described by 30 contributing specialists. Part II is a glossary of terms, with definitions; to this four additional specialists contributed, but major credit must go to the editor. The arrangement is alphabetical, the treatment first general then by use in various orders as required, with invaluable cross-references and lists of synonyms.

With such a large number of contributors, there is naturally a variation in method of illustration, with some very fine examples of draftsmanship. If more authors had used Michener's system of naming all parts of figures in full on the drawings *(e.g.*, Hymenoptera, figs. 153–159, p. 134), the six-page "List of abbreviations on the figures" would not have been needed. We owe much to Dr. Tuxen for his highly successful editorship. It is fortunate for many of us that the book is in English.

At the same time it is too bad that this book, by authors who are essentially taxonomists, could not have been preceded by the latest work of a master morphologist: "A revised interpretation of the external reproductive organs of male insects," by R. E. Snodgrass (Smithsonian Miscell. Coll., Vol. 135, No. 6, pp. 1–60, 15 text figs. Smithsonian Institution, Washington, D.C. December 3, 1957). This contains basic revaluations and should be in the hands of everyone using the book by Tuxen, *et al.*—HUGH B. LEECH, *California Academy of Sciences, San Francisco.*

THE LOUSE POPULATIONS ON SOME DEER MICE FROM WESTERN OREGON[1]

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Between August 27 and 31, 1956 a series of 194 deer mice (*Peromyscus maniculatus* Wagner) were taken from the vicinity of Beverly Beach State Park which is just south of Otter Rock, Lincoln County, Oregon. The animals were collected by setting out lines of snap traps along the trails and old logging roads which traversed the area. The traps were placed one to the station with a spacing of about 30 feet between stations. The traps were baited with peanut butter, and, for the most part, left set for two days. A total of 657 trap stations took 111 deer mice the first night and 620 stations took 87 deer mice the second night of trapping, which is at the rate of 169 and 140 deer mice per 1000 trap stations for the first and second nights, respectively. These trap success figures indicate a very high population density.

To prevent transfers of lice from one host specimen to another and to reduce loss, each mouse was placed in a separate one-pint size polyethylene home food freezer bag immediately on recovery from a trap (Cook, 1954b). Each bag was numbered, and each skin was returned to this original bag after the host was examined, skinned and the skin dried. The recovery of the lice was accomplished by placing the whole skin in a solution of trypsin followed by KOH (Cook, 1954a). The lice were then strained out of the resulting solution.

This report is concerned with the population structure and occurrence of the two species of Anoplura *Hoplopleura hesperomydis* (Osborn) and *Polyplax auricularis* (Kellog and Ferris) which were found on the deer mice.

RATE OF INFESTATION

In all, 65.3% of the deer mice examined harbored *H. hesperomydis* and/or *P. auricularis*. The former were the more common being found on 57.2% of the hosts while the latter were found on but 18.9%. Only 10.7% of the deer mice were found to be infested with both species of lice.

When it was discovered that two species of lice were com-

[1] Paper No. 3855 Scientific Journal Series, Minnesota Agricultural Experiment Station, St. Paul, Minnesota.

monly found on this host population two hypotheses were set up to be tested. The first was that since some mice do not have lice that there was a difference in the "resistance" to louse infestations among these hosts. If this were true it should follow that the two species of lice would be found on the some hosts more commonly than would be expected by chance. The other hypothesis suggested that either the two species of lice had separate and distinct host requirements or that there would be direct competition between them. In either case they should be found together less often than would be expected by chance distribution. In order to test these hypotheses we calculated Cole's (1949) coefficient of interspecific association. The value $C \pm O = 0.007 \pm 0.016$ suggests that neither hypothesis was correct and the two species of lice are distributed among the hosts independently of each other. This situation allows the population data for the two species to be analyzed separately.

Hoplopleura hesperomydis was found on about 57% of the deer mice. However, there is some difference in the rate of infestation between the sexes. This louse was found on 62% of the males but on only 52% of the females. A Chi-square value of 7.01 suggests that this is a real difference rather than one to be expected by chance. When the sample is broken down into size groups (these groups are assumed to represent age classes with those over 90 mm. in body length representing adults and those under this length representing sub-adult mice) there is no significant variation in rate of infestation in the male deer mice. There is considerable apparent difference in rate of infestation between the size classes of females with an indication that the adult females have a lower rate of infestation than the sub-adult females. A Chi-square value of 24.3 suggests that this is a real difference. The rate of infestation is much higher than that found by us (Cook and Beer, 1955) from deer mice from northern Minnesota. The Minnesota infestation rates for *H. hesperomydis* were 41 and 15% as compared with 57% for this sample. The tendency for the males to have a higher infestation rate is suggested in both studies. However, the Minnesota deer mouse material showed no indication of shift in infestation rate with size (age) of host in either sex.

A much lower proportion of the deer mice were found to be infested with *P. auricularis* than with *H. hesperomydis*. About

19% of the deer mice were infested by *P. auricularis* and there was again a difference in the rate of infestation of the males and females. About 13% of the female and 25% of the male deer mice were infested. A Chi-square value of 13.8 again suggests that this is a significant difference. There is very little apparent variation in the rate of infestation with size class in either the male or female deer mice. However, the samples are very small and definite conclusions cannot be made in relation to the rate of infestation and age of host.

Louse Population Structure

The detailed population structure of the lice on the infested deer mice is given in table 1. In all, 1327 *H. hesperomydis* and 86 *P. auricularis* were examined. The size of the infestations

Table 1.—Louse populations on *Peromyscus maniculatus*

Sex of Host	Body Length in mm.	No. of Hosts Examined	Per Cent Infested	Total Lice	Lice per Infestation Max.	Min.	Ave.	Structure of Louse Populations in per cent: Adults ♂♂	Adults ♀♀	Developing Instars 1st	2nd	3rd
				Hoplopleura hesperomydis								
♀♀	70-89	63	65	387	59	1	9.4	32	43	13	7	5
	90-105	31	26	168	106	1	21.0	21	47	24	7	1
		94	52	555			11.3	28	44	16	7	4
♂♂	70-89	85	61	657	247	1	12.6	27	36	32	4	2
	90-105	17	65	115	37	1	10.5	44	47	7	2	0
		102	62	772			12.3	29	37	28	3	2
				Polyplax auricularis								
♀♀	70-89	63	14	32	12	1	3.6					
	90-105	31	10	4	2	1	1.3					0
		94	13	36			3.0	19	53	3	25	0
♂♂	70-89	85	20	33	3	1	1.9					
	90-105	17	47	17	3	1	2.1					
		102	25	50			2.0	32	48	10	6	4

varied greatly as has been reported from other studies (Cook and Beer, 1954; Hopkins, 1949). The average size of the infestations for *H. hesperomydis* and *P. auricularis* was 11.8 and 2.3 lice, respectively. The maximum number of *H. hesperomydis* was 247 and of *P. auricularis* 12. Both louse species show a skewed distribution of population sizes with the maximum being many times the mean. There is considerable variation in the average size of infestation between size (age) classes as shown in Table 1 but the significance of these differences is difficult to determine

owing the the presence of a few heavily infested animals. For instance, nearly two-thirds of the *H. hesperomydis* found on the adult female deer mice were from one deer mouse. There appears to be little difference between the infestations on the male and female deer mice (see table 1).

The adult lice made up from 66 to 80% of the total population indicating a rather low rate of reproduction at this time. Our studies of *H. hesperomydis* on deer mice in northern Minnesota have indicated a higher proportion of immatures (Cook and Beer, 1954) where we found from 38 to 60% adults with an average of 45%. The sample of *P. auricularis* is too small to discuss in detail except that it appears to follow the same general pattern as that found in *H. hesperomydis*.

The age structure of the *H. hesperomydis* shows a relatively high proportion of 1st instars, a moderate number of 2nd instars, and only a few 3rd instars (see Table 1) indicating either a rather high mortality rate among the young lice or that the 1st instars remain in this stage longer than the later instars. There are no data on the developmental rate of this species. The proportions of the several instars are in line with that reported for Minnesota materials (Cook and Beer, 1954).

In both species of lice the females were more abundant than the males, the male *H. hesperomydis* on the female deer mice made up about 39% of the adults while on the male mice they comprised about 44%. The *P. auricularis* had a similar sex ratio with about 35% of the adults being males.

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A NEW SPECIES OF IDIOGRAMMA FOERSTER WITH NOTES ON TWO OTHER SPECIES

(Hymenoptera: Ichneumonidae)

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In the course of a study of a new species of *Xyela* on Coulter Pine, *Pinus coulteri*, one mile east of Mount Hamilton, Santa Clara County, California, a new species of *Idiogramma* was collected. This new species keys out to *I. fraternus* Townes and Townes (Townes and Townes, 1951) but may be distinguished by the length of the forewing (greater than 3.5 mm. as opposed to less than 3.5 mm.) and the ratio of the ovipositor length to that of the forewing (1.4 versus 1.0). The difference in the length of the forewing is greater when like sexes are compared. The forewings of the males of *I. fraternus* measure 2.7–3.0 mm. while the forewings of the new species range from 3.7–4.0 mm. (males) and vary from 4.5–5.0 mm. (females).

Idiogramma titana Burdick, new species

Female: Mandible a little narrower at base of teeth than at middle, teeth weakly divergent and distinctly recurved; frons not yellow laterally; a faint longitudinal impression extending between the posterior ocelli to back of head; occipital carina interrupted medially; forewing 4.5–5.0 mm. Color: ground color black; face to upper edge of antennal sockets, clypeus, mouthparts, except teeth of mandible, lower 0.2 of temple, underside of scape and pedicel, tegula, hind corner of pronotum, fore coxae, trochanters, fore and middle femora, fore and middle tibiae, short thin band at apex of first tergite, and a narrow apical band on the second and following tergites (interrupted laterally) pale yellow; tarsi brownish.

Male: Like female except venter of abdomen yellow and forewing 3.7–4.0 mm. long.

Holotype female, 1 MILE EAST OF MOUNT HAMILTON, SANTA CLARA COUNTY, CALIFORNIA, May 25, 1956 (D. Burdick) associated with *Pinus coulteri.* The allotype and the four paratypes have the same data as the holotype. The holotype and allotype are deposited in the U.S.N.M. One pair of the paratypes has been placed in the California Insect Survey, the remaining pair has been presented to H. K. Townes.

The most striking feature of this new species is its size, which is about twice that of any of the known species. The size may be

correlated with that of the suspected host, an undescribed species of *Xyela*, which is twice as large as any known *Xyela*, and is the only one living on Coulter Pine at the Mt. Hamilton locality. This genus of ichneumonids has been associated with *Xyela* since R. A. Cushman (1937) found that the ovarian eggs of the wasp were identical to those found on the *Xyela* larvae. Also, the adult parasites are known only from the vicinity of pines during the period of the growth of the staminate cones. The *Xyela* larvae feed within these cones and drop to the ground shortly after the cones open to release the pollen.

From the same locality, four males of *I. fraternus*, but no females, were collected from Coulter Pine. The females may be associated with the Digger Pine, *Pinus sabiniana* which was shedding pollen on this date (May 21, 1956) while the Coulter Pine did not start shedding pollen for another two or three weeks. This supposition is supported by a correlation of the distribution of *I. fraternus* with *Xyela minor* Norton and *X. bakeri* Konow. These two species range from east to west on a number of species of pines including Lodgepole Pine, *P. contorta*, and Ponderosa Pine, *P. ponderosa*, which are the pines from which *I. fraternus* was collected by Townes and Townes (1951).

I. contortae Townes and Townes was collected from Bishop Pine, *Pinus muricata*, four miles west of Plantation. Sonoma County, California, on April 21, 1957. This wasp has been taken from Lodgepole and Ponderosa Pine (Loc. cit.), and its presence on Bishop Pine is probably due to the similar time of staminate cone development (hence, similar time of *Xyela* larval emergence time) of Lodgepole and Bishop Pine along the Pacific coast. There is apparently no host specificity as the *Xyela* species found on Bishop Pine are different from those on Lodgepole Pine.

I wish to thank H. K. Townes for his encouragement and gift of specimens for comparison.

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NEW SPECIES OF LINDENIUS FROM WESTERN NORTH AMERICA

(Hymenoptera:Sphecidae)

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The genus *Lindenius* Lepeletier and Brullé is a group of small black crabronids with restricted yellow markings. The species are largely Holarctic and were placed in two subgenera, *Lindenius* and *Trachelosimus* Morawitz, by Pate (1947). In a recent paper on the Palearctic forms de Beaumont (1956) has avoided the use of subgenera and has substituted species groups. He listed five groups and six additional isolated species. Examples of each group have been furnished us by P. M. F. Verhoeff. All of the seven previously known North America species are referable to *Trachelosimus* which corresponds to the *pygmaeus* group of de Beaumont. One of these, *dugesianus* Leclercq (1950), described from Guanajuato, Mexico, we have seen also from Sinaloa, Nayarit, and southwestern United States (southern California, Arizona, New Mexico, western Texas). Arizona specimens were kindly compared with the type by J. Leclercq. We are adding three new species to the *pygmaeus* group and a fourth which seems to be isolated.

Holotypes of the new species will be deposited in the California Academy of Sciences, San Francisco. Paratypes will be distributed to cooperating institutions insofar as possible. We wish to acknowledge the following individuals and institutions for materials used in preparation of this paper: P. M. F. Verhoeff, Netherlands, J. Leclercq, Belgium; J. de Beaumont, Switzerland; E. S. Ross, California Academy of Sciences (C.A.S.); G. D. Butler, University of Arizona; K. V. Krombein, U.S. National Museum; W. L. Brown, Jr., Museum of Comparative Zoology; P. H. Timberlake, University of California, Riverside; P. D. Hurd, California Insect Survey, University of California, Berkeley; and A. T. McClay, University of California, Davis.

Lindenius californicus Court and Bohart, new species

Male.—Length of body 4 mm., forewing 2.8 mm. Color, black with whitish yellow as follows: mandible on basal one-half, scape in front, humeral ridge broken medially, pronotal tubercle partly, scutellar spot, femora distally, fore and mid tibiae extensively in front, hind tibia on outer basal one-half, tarsi darkening apically; wings lightly smoky; flagellum in front, tegula, and wing veins brown; mandible tip and pygidium reddish brown.

Pubescence silvery, mostly scanty, dense on clypeus and inner orbit, mesopleuron, and thoracic venter (longest). Puncturation moderate; mesonotal punctures separated by about 1.5 diameters, intervening area shagreened in trough, mostly polished elsewhere; scutellum with many scattered fine punctures; propodeal enclosure faintly striate; pleuron well punctured, rather dull; propodeum and metapleuron shiny but finely shagreened; abdomen shiny, practically impunctured. *Head* with mandible evenly curved; oral fossa oval, distinctly broader than long; clypeal apex truncate, notched submedially (similar to that of female, figure 8); antennal sockets nearly contiguous, well removed from compound eyes, scape nearly straight, flagellum not beaded or ridged beneath (fig. 7); supra-antennal tubercle sharp; ocellocular distance 2.3 times diameter of lateral ocellus; development of head in midline behind ocelli about four-fifths ocellar breadth; occipital carinule ending simply about 1.3 ocellus diameters from hypostomal carina; no genal carina. Thorax with humeral and posthumeral angles present (fig. 1); mesonotum with a deep median trough, somewhat flattened at bottom, sharp-edged laterally, the edges not punctate, area between trough and tegula very slightly concave with a small tubercle at middle, area rounded off at front toward pronotum (fig. 1); propodeum in posterior view with an upper inner smooth area on each side and an outer punctato-striate area.

Female.—Length of body about 6 mm., forewing 3.8 mm. About as in male except as follows: upper frons closely punctured. Ocellocular distance 1.9 times diameter of lateral ocellus. Propodeal enclosure very finely and obliquely striate. Pygidial shape as in fig. 11.

Holotype male (C.A.S.), Davis, Yolo County, California, June 28, 1957 (H. K. Court). *Paratypes* (all from California), 6 females, Oakley, Contra Costa County, September 26, 1937 (E. C. VanDyke); 1 female, Firebaugh, Fresno County, September 9, 1948 (R. F. Smith); 3 males, 7 females, Tracy, San Joaquin County, May 31–October 26, 1949–1952 (J. MacSwain, R. Smith); 4 males, 1 female, Vallejo, Solano County, August 31, 1953 (E. I. Schlinger); 7 males, 8 females, topotypes, June 27–October 23, 1952–57 (R. Bechtel, R. Bohart, H. Court, J. Downey, A. McClay, E. Schlinger, A. Telford); 2 males, 1 female, Elkhorn Ferry, Yolo County, August 1, 1956 (R. M. Bohart); 1 female, Woodland, Yolo County, August 17, 1955 (A. T. McClay).

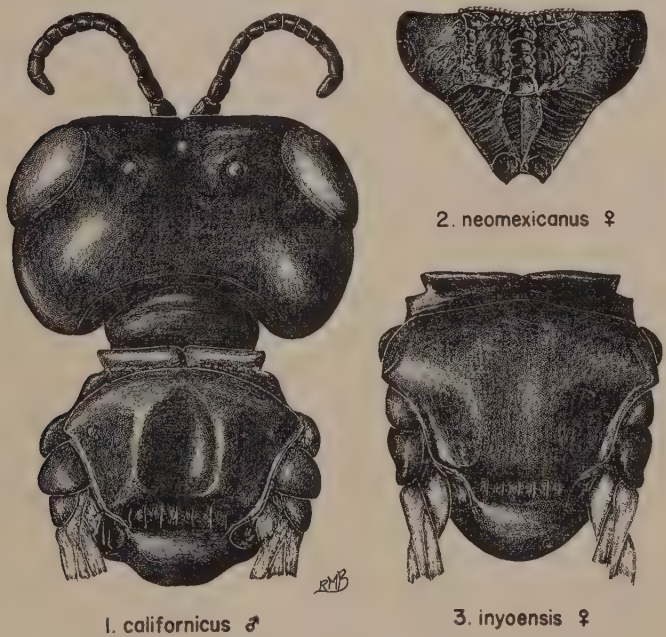
We have also seen California specimens from Amador County (Ione) and Mendocino County (Hopland).

The broad mesonotal trough and lateral tubercle indicate a relationship with *tecuya* Pate. In *californicus* the area between the trough and the tegula is hardly impressed and is not limited anteriorly whereas in *tecuya* this area is definitely depressed and limited by a carina or ridge which runs from the anterior end

of the trough laterally to the tegula. A third related species, *inyoensis*, is much like *californicus* but has only a slight central depression instead of the deep trough. All three species, in addition to the mesonotal modeling, are characterized by rather heavy thoracic puncturation.

Lindenius inyoensis Court and Bohart, new species

Male.—Markings, pubescence, puncturation, and structure as described for *californicus* except as follows: Head and forelegs missing. Forewing length 3.1 mm. Thorax including tegula all black. Puncturation moderately fine but close on thorax, mesonotal punctures contiguous anteriorly, separated by about a puncture diameter posteriorly, scutellum slightly longitudinally striate, punctured as on posterior part of mesonotum; propodeal enclosure areolate. Mesonotum very slightly depressed medially forming a low rounded submedian ridge, area between ridge and tegula flattened, with a small ridge-like tubercle near middle, area rounded off



EXPLANATION OF FIGURES

Figs. 1–3, structural features of *Lindenius* species. Fig. 1, head and most of thorax from above, holotype. Fig. 2, dorsal view of propodeum, holotype. Fig. 3, pronotum, mesonotum and scutellum, holotype.

in front toward pronotum but sharply angled and ridged just in front of tegula (fig. 3).

Female.—About as described in male, head as described for female *californicus* except as follows: Scape partly dark in front; ocellocular distance 2.0 times diameter of lateral ocellus; occipital carinule ending simply about 2 ocellus diameters from hypostomal carina. Pronotum with small sublateral humeral yellow spot and obscure spot on tubercle. Length 5 mm., forewing 3.2 mm. Pygidium (fig. 14).

Holotype female (C.A.S.), LITTLE LAKE, INYO COUNTY, CALIFORNIA, September 3, 1956 (R. M. Bohart). Paratopotype, 1 male, May 20, 1951 (E. I. Schlinger).

Reference should be made to the treatment of *L. californicus* for a discussion of this species.

Lindenius tylotis Court and Bohart, new species

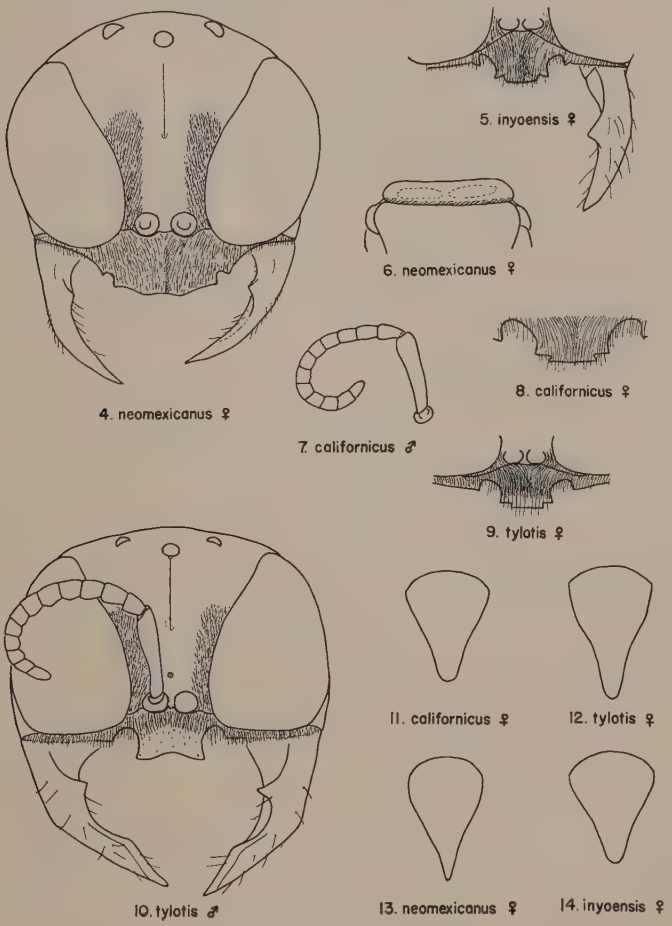
Male.—Length 5.5 mm., forewing 3.5 mm. Markings, puncturation, and structure as described for *californicus* except as follows: Scutellum dark, fore femur extensively yellow in front, hind tibia yellow on basal one-third, flagellum, tegula, and wing veins nearly black. Pubescence of mesopleuron scanty; median cell of forewing with anterior one-half moderately setose; puncturation fine and mostly sparse, punctures of mesonotum minute, separated by about 3 times their diameter, intervening area polished; integument of frons, vertex, mesonotum, scutellum, pleuron, and abdomen shiny. Mandible bent inward near middle, expanded subapically (fig. 10); clypeus with broad, bare, shiny concavity on apical one-half, apex sharply and somewhat irregularly truncate (fig. 10); antennal sockets nearly contiguous; scape swollen in distal two-thirds, flagellum somewhat serrate beneath, each segment with a linear tylus (fig. 10); development of head in midline behind ocelli equal to ocellar breadth; occipital carinule ending in an obtuse angle or tooth, about 2.2 ocellus diameters from hypostomal carina. Mesonotum smoothly convex, with a faint sublateral mark or scar opposite tegula.

Female.—About as in male except as follows: Puncturation of head and thorax a little closer than in male but fine; pubescence of thoracic venter short and moderate; fore femur with a distal yellow spot. Head with mandible evenly curved; clypeus notched subapically, not depressed, outline as in fig. 9; flagellar segments simple, length proportions about as in male; occipital carinule ending simply 1 ocellus diameter from hypostomal carina; ocellocular distance 2.0 times the diameter of lateral ocellus. Pygidium incurved laterally, apical part long (fig. 12).

Holotype male (C.A.S.), DAVIS, YOLO COUNTY, CALIFORNIA, May 15, 1956 (R. M. Bohart). *Paratypes*, 47 males, 33 females, topotypes, April 21–August 15, 1948–57 (R. Bechtel, R. Bohart, H. Court, D. Dahlsten, J. Downey, A. McClay); 40 males, 100 females, Arroyo Seco Camp, Monterey County, California, May 5–June 6, 1956–57 (R. Bechtel, R. Bohart, D. Burdick).

We have also seen specimens from Contra Costa County (Danville), Glenn County (Hamilton City), Mariposa County

(El Portal), San Joaquin County (Corral Hollow), Shasta County (Hat Creek), Tulare County (Wood Lake), and Tuolumne County (Tuolumne City).



Explanation of Figures

Figs. 4–14, structural features of *Lindenius* species. Fig. 4, anterior view of head, holotype. Fig. 5, clypeus and mandible, holotype. Fig. 6, dorsal view of pronotum, holotype. Fig. 7, antenna, holotype. Figs. 8, 9, clypeus paratypes. Fig. 10, anterior view of head, holotype. Figs. 11–14, pygidial outlines.

This species resembles *dugesianus* Leclercq in that the mandibles of the males are similarly shaped. However, those of *tylotis* are more strongly bent and broader subapically. In addition the flagellum of *tylotis* has the segments distinctively ridged and subserrate beneath. The females of the two species are distinguished by the very sharp lateral angles of the median clypeal lobe and the sparser setation of the median cell of the forewing in *dugesianus*. *Tylotis* is the largest species known in North America, but the size is variable. Our largest specimens, with a body length up to 7.5 mm., are females from Arroyo Seco in the coastal mountains of Monterey County and Tuolumne City in the lower Sierra. Other females are as small as 5.5 mm.

Lindenius neomexicanus Court and Bohart, new species

Female.—Length of body 5 mm., forewing 3.8 mm. Color, black with whitish yellow as follows: Mandible mostly, scape in front, flagellum beneath, transverse disconnected spot on pronotum, spot on tubercle, posttegula partly, fore femur distally, fore and mid tibiae broadly in front, hind tibia basally; wings nearly clear, veins brown; mandible, tarsi partly, and pygidial tip reddish brown. Pubescence silvery, mostly scanty, dense on clypeus and lower orbit. Median cell of forewing moderately setose in anterior one-half, sparse otherwise. Puncturation fine, top of head lightly shagreened, mesonotum, scutellum, and postscutellum more heavily so, dull; mesonotal punctures separated by about three times their diameters, intervening area minutely reticulate; enclosure of propodeum divided by broad, longitudinal, pocketed groove, submedially with somewhat oblique carinae, posterior area of propodeum with a central triangular depression, flanked by roughened area traversed by faint transverse carinulae, pleuron with fine scattered punctures, shagreened, propodeum laterally shiny; abdomen practically impunctured, faintly shagreened. *Head* with mandible evenly curved, slender, a weak obtuse tooth on inner margin at basal one-third; oral fossa nearly circular; clypeal apex broad, wavy, extending over mandibles when closed, flanked by small sinus and secondary tooth (fig. 4); antennal sockets separated by one-half their diameter from each other and from compound eye, scape simple, nearly straight, first flagellar segment equal in length to pedicel, following two slightly shorter; no supra-antennal tubercle; dorsal view more than twice as broad as long, least interocular distance about two-fifths distance at anterior ocellus; occipital carina bending inward and ending about four ocellus diameters from hypostomal carina; genal carina complete from mandible base to occipital carina. Pronotum rounded, not carinate, with a narrow posterior groove (fig. 6); mesonotum smoothly convex with a faint sublateral scar opposite tegula. Abdomen with pygidium (fig. 13) sharp, shiny, depressed toward apex.

Male (abdomen missing).—Markings and structure about as in female except as follows: Length of forewing 2.9 mm. Pronotum black. Antennal sockets separated from each other and compound eye by a little more than one-half their diameter; lease interocular distance one-half as great as

distance at anterior ocellus. First three flagellar segments subequal, a little shorter than pedicel.

Holotype female (C.A.S.), Omega, Catron County, New Mexico, August 18, 1951 (E. L. Kessel). Paratype male (R. R. Dreisbach collection, Limon, Colorado, August 16, 1949 (R. R. Dreisbach and R. K. Schwab).

The long oral fossa, the absence of a supra-antennal tubercle, and the simple pronotum relate this species to several of the Palearctic groups. However, the genal carina is a distinctive character of at least group significance. Furthermare, the clypeus is peculiar in its broad median lobe flanked by a weekly developed sinus.

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BOOK REVIEW

THE WATER BEETLES OF FLORIDA. By. Frank N. Young. x+238 pp., 31 text figs. (most are compound). University of Florida Studies, Biological Science Series, Vol. V, No. 1. Gainesville: University of Florida Press. May 25, 1954. Price $6.00.

In his preface Dr. Young writes, "At the beginning of my studies of the water beetles of Florida, I had in mind the production of a work which was to be largely ecological in approach. . . . Unfortunately, the problem of applying names to the various forms proved so difficult and involved that the greater part of my time and effort was expended upon preliminary taxonomic problems, many of which are still unsolved." Others have had this trouble — for instance Dr. L. H. Weld, who wanted to work out the biologies of gall wasps, but instead has been forced to spend a lifetime on the taxonomy of the group—and certainly points out the urgent need for basic taxonomic work.

Based on an examination of some 30,000 specimens, Dr. Young treats the families Dytiscidae, Noteridae, Haliplidae, Gyrinidae, Hydrochidae, Hydrophilidae, Limnebiidae, Dryopidae and Elmidae. The section on ecological distribution (pp. 5–34, 1 map) is the first such treatment for any Nearctic aquatic beetles, and is supplemented by notes throughout the taxonomic part. Since his interests extend far beyond water beetles, and include studies on the distribution of land snails, he has written a discussion of the top-

ography and vegetation of Florida of value to many besides coleopterists.

The taxonomic section (pp. 36–220) is a pleasure to use, and has been drawn up with a view to helping the non-specialist. The language is simple and clear. Differentiating characters which might puzzle the beginner are illustrated in the key to families and subfamilies; outline drawings of a typical example of each of four families, dorsal and ventral with parts named, head the treatment of those families. In the discussion of species the data are given in a regular manner for each: synonomy, diagnosis, taxonomic notes, variation, range, habitat preferences, selected references, and specimens examined. Herein lies one of my few criticisms of the book, and it is a matter of typography only: the prominence given to the last two of the above divisions, as capitalized centered headings, make it difficult to pick out the name, in centered italics, beginning the discussion of each species.

The extent of his field work is shown constantly by his records of widespread captures for species previously listed from only one or two localities, or a single county. Throughout the text there are concise references to the literature (accurately cited in full in a terminal bibliography), an invaluable help.

Dr. Young is to be commended for his treatment of the Noteridae and Hydrochidae as distinct familes, and the Berosinae as a valid subfamily of the Hydrophilidae (through *Derallus* may have to be excluded, as he says). The dytiscid genera *Laccodytes* Régimbart, *Brachyvatus* Zimmerman and *Anodocheilus* Babington (written *Anodochilus* by Young), not recognized in former papers published in this country, are correctly treated. His use of subgenera in *Hydroporus* is less acceptable, but the solution is not one for a regional study. It can be solved only by a thorough reworking of the various genera and subgenera proposed at the expense of *Hydroporus s. lat.*, and must be done with at least a Holarctic basis.

Since *Celina contiger* Guignot was not seen by Young, and has been known only from the type, it may be well to record a male taken at light by Carl Parsons at Sebring, Okeechobee County, September 10, 1942. With it were examples of *Pronoterus semipunctatus* (LeConte) and *P. addendus* Blatchley. For persons using the book beyond the boundaries of Florida it is worth remembering that the rare *Hoperius planatus* Fall resembles the common *Rhantus calidus* (Fabricius) closely enough in general facies to be passed over by the uncritical.

The spelling of one generic name in the Hydrophilidae should be changed: *Spherchopsis* to *Sperchopsis* (pp. 24, 33, 166, 172).

Dr. Young should also be congratulated for his candid admission of many unsolved problems, and for drawing attention to them throughout the text, an excellent stimulus for other students. Some of these puzzles must await adequate collections from the Antillean-Caribbean region and South America; others, especially at the species level in the genus *Hydroporus*, will be unriddled on the basis of U.S.A. material. His book is a fine beginning and guide, and is highly recommended.—HUGH B. LEECH, *California Academy of Sciences, San Francisco.*

A NEW ASTEROLECANIID SCALE ON SUCCULENTS FROM MEXICO

(Homoptera; Coccoidea; Asterolecaniidae)

HOWARD L. McKENZIE
University of California Davis

The discovery of mounted examples of this most unusual scale came quite by accident during a routine search for new California species of mealybugs. Superficially, the new Asterolecaniid resembles certain mealybugs belonging to the genus *Antonina* which, in the adult stage, are characterized by having much reduced antennae, and legs entirely lacking (apodous). Slide preparations of the new scale were found intermixed in a box of indeterminate mealybugs belonging to Stanford University, this material on loan to the University of California at Davis.

It has been the good fortune of the author to have had the aid of Professor G. F. Ferris, one of the world's foremost Coccidologists at Stanford University, not only in working up the technical description of this extraordinary scale, but also in the delineation of the species. To him the author is deeply indebted, and to show his gratitude wishes here to dedicate the species in his honor.

Following the technical description of the genus and species, a revised key to North American genera of Asterolecaniidae is presented.

Sclerosococcus McKenzie, new genus

Genotype.—This genus is here established for the reception of a single species, *Sclerosococcus ferrisi* McKenzie, described as new in this publication.

Recognition characters.—Apparently to be assigned to the family Asterolecaniidae by reason of its possession of geminate (8-shaped) pores. Body of the adult female entirely membranous except for the three terminal segments, which are somewhat sclerotized. Form ovoid, tapering to the posterior end. Legs entirely lacking in the adult female. Antennae present, reduced to a single segment which is deeply invaginated at its apex and bears three or four quite stout setae. Body with, in the cephalic and thoracic regions both dorsally and laterally, a broad band of rather small, circular pores, each of which seems to contain six loculi and which are for the most part arranged in groups of from two to several. Spiracles each with a crescent of similar, but noticeably smaller pores. Interspersed among these pores are a

considerable number of large tubular ducts which terminate at their inner end in a geminate (8-shaped) pore. Between these and the terminal segments of the body is an area which bears dorsally a number of much smaller ducts of a similar type. The fourth to sixth segments from the posterior end of the body bear each a transverse series of quite large circular pores which present a quinquelocular appearance. All pores and ducts present an evident variation in numbers as between opposite sides of the same body in the same individual. Anal opening in a very small ring, hairless and concealed on the dorsal side of the body by the overhanging terminal segment, and on the ventral side by a narrow median sclerotized flap. The sclerotization of the terminal segments of the body extends over the dorsum and around the margin slightly to the ventral side of the body. Embryonic nymphs are contained within some of the available specimens, but none of these are in condition to permit illustration. Antennae six-segmented.

This species seems unmistakably to belong to the family Asterolecaniidae, a family which Ferris (1955) has defined in Atlas of the Scale Insects of North America, Volume VII, pages 8–14. Apparently the most distinctive feature of this family is the common presence of pores of the geminate (8-shaped) type. The new genus, *Sclerosococcus*, differs from any that has been described in the absence of any of the features that are distinctive of other families. It shares with *Mycetococcus* Ferris, a sclerotization of terminal abdominal segments, but is easily differentiated from this and all other Asterolecaniidae by the nature and distribution of its various ducts and pores.

Sclerosococcus ferrisi McKenzie, new species

(Figure 1)

Hosts and distribution.—From "succulents" from Mexico, taken in quarantine at Los Angeles, Los Angeles County, California, August 31, 1933, by W. F. Hiltabrand.

Type material.—Type slide (one specimen) and three paratypes will be deposited in the University of California, Department of Entomology and Parasitology, museum collection, Davis, California. Three paratype specimens will be placed in the Stanford University, California, collection, and two paratypes will be sent to the United States National Museum, Washington, D.C.

Habit.—No information.

Recognition characters.—The description of the genus will apply as the description of this species. Length about 1.00 mm.

As previously mentioned, there are no known species of Asterolecaniidae which this new form approaches. At the moment,

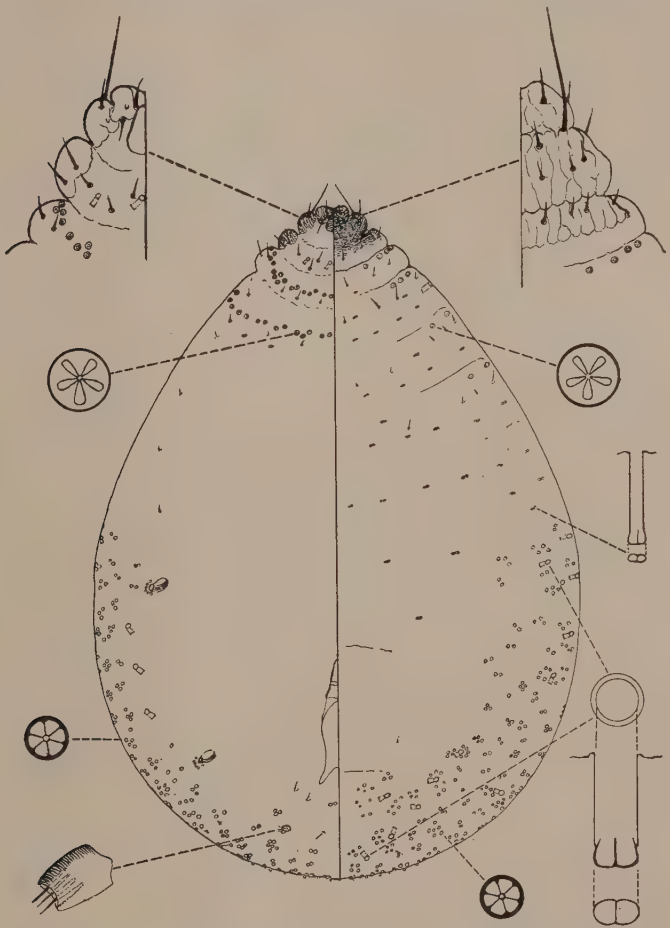

Figure 1.—*Sclerosococcus ferrisi* McKenzie, a new Asterolecaniid scale infesting succulents from Mexico, taken in quarantine at Los Angeles, California.

it appears to stand by itself as a sort of entomological curiosity.

With the addition of the new genus, *Sclerosococcus*, just described, it seems advisable to recast the key to North American genera of Asterolecaniidae as given by Ferris (1955) in his Atlas of the Scale Insects of North America, Volume VII, page 14. The modification of the key is here presented.

KEY TO NORTH AMERICAN GENERA OF ASTEROLECANIIDAE

1 Adult female with the apical lobes and posterior extremity of the abdomen strongly sclerotized 2
Adult female at times with the anal lobes sclerotic but this never involving the posterior extremity of the body 3

2(1) Cephalic and thoracic regions, both dorsally and ventrally, with small, circular six loculi pores, these pores arranged in groups from two to several; circular quinquelocular pores present, both dorsally and ventrally, on fourth to sixth abdominal segments from posterior end ..... *Sclerosococcus*
Circular six loculi pores lacking anywhere on body; quinquelocular pores not present on abdomen ..... *Mycetococcus*

3(1) Adult female with no evidence of anal lobes; with no evidence of pores other than a dorsal circle of quinqueloculars; with a small, dorsal, median, sclerotized plate; occurring as far as known only on palms ..... *Mycococcus*
Adult female without these characters, with geminate pores 4

4(3) Adult female always with a distinct, sclerotized, caudal plate overlaying the anal opening ..... *Cerococcus*
Adult female without a caudal plate 5

5(4) Adult female without tubular ducts; with only geminate pores on the dorsum ..... *Pollinia*
Adult female always with some tubular ducts on dorsum 6

6(5) Adult female always with 7–8 segmented antennae, these well developed ..... *Lecaniodiaspis*
Adult female with the antennae represented by mere tubercles ..... *Asterolecanium*

EXACT DATA FOR CERTAIN LOCALITY LABELS USED BY F. E. BLAISDELL

HUGH B. LEECH

California Academy of Sciences, San Francisco

Like many collectors in the same period, it was Dr. Blaisdell's habit in his earlier years to use printed locality labels marked in general terms, such as "Cal." By a series of dots and strokes in red or black ink, he developed a code on these and others to indicate restricted localities. His notebook containing the code

is in the Department of Entomology of the California Academy of Sciences, but since he exchanged beetles extensively with other collectors, it may be well to place the data on record. Of course, they should be used only to interpret labels known to have originated from Dr. F. E. Blaisdell, Sr.

Following is his code, in places paraphrased and with counties inserted. Comments by the writer are in parentheses.

On Base Label "Cal.":

(1) With a red dot in the "C"—Stockton, San Joaquin County.
(2) Red dot in lower part of "a"—Sissons, Siskiyou County. (This town, some 10 miles south of Weed on U.S. Highway 99, is now called Mount Shasta City.)
(3) Red dot over "a"—Vicinity of Sacramento, Sacramento County.
(4) Red dot over "a", and a red line at each end of "Cal."—Vicinity of Los Angeles, Los Angeles County.
(5) Red dot over "a", and a red line under "Cal."—Siskiyou County.
(6) "Cal." underlined in red—Shasta Retreat. (Dr. Blaisdell records this as in Shasta County, elevation 2,416 feet, but it is actually in southern Siskiyou County, about a mile north of Dunsmuir.)
(7) Red line above and one below "Cal."—"Summit from Riverton to point of descent through Sierra Nevada, up grade, along the American River." (I judge this to be from Riverton eastward on U.S. Highway 50 to Echo Summit, all in Eldorado County.)
(8) Red line through "Cal."—San Francisco County.
(9) Red line across the top of "l"—Lincoln, Placer County.
(10) Two vertical red lines under "a"—Blue Lakes, Alpine County.
(11) Red line at each end of "Cal."—Tallac, above Lake Tahoe, elevation 6,280 feet. (In Eldorado County, on the southern shore of Lake Tahoe, and just north of Fallen Leaf Lake.)
(12) Vertical red line through "C"—San Mateo County, near Holy Cross Cemetery.
(13) Oblique red line from bottom of "C" to top of "l"—"Big Trees and vicinity." (Calaveras Big Trees, on State Highway 4, in southeastern Calaveras County; this is nearly due east of Mokelumne Hill, which was Dr. Blaisdell's home for eight years.)
(14) "Cal." in red parentheses—Hermit Valley, Alpine County.
(15) "Cal." in black parentheses—Fyffe to Riverton on the South Fork of the American River, Eldorado County.

On Other California Labels:

"Guerneville, Sonoma Co. Cal."—With a red mark added under the "G", is for Monte Rio, Sonoma County. (This is about three miles downstream on the Russian River from Guerneville.)

"Lake Co. Cal."—With a red dot under "a" of Lake, is Anderson's Springs. (This is a few miles northwest of Middletown on State Highway 29.)

"*MOKEL. HILL, CAL.*"—(Dr. Blaisdell practiced medicine at Mokelumne Hill, Calaveras County, 1892–1900.)

(1) "O" with a red center—Glencoe, 10 miles northeast of Mokelumne Hill.

(2) "K" reddened—West Point, 20 miles northeast of Mokelumne Hill.

(3) Red line under "HILL"—Same as preceding: West Point.

"*Napa Co. Cal.*"—With a red dot over first "a" in Napa, is St. Helena, Napa County.

Other Locality Labels:

"*Ky.*"—With a red line over the "y" is Versailles, Woodford County, Kentucky.

"*Or.*"—

(1) "O" with a red line across center—Oregon City, on Willamette River, 15 miles south of Portland.

(2) Plain, no markings—From about Portland and St. Johns on Willamette River.

"*W.T.*"—"Plain label about Seattle, Washington State. A few bearing such in my collection have been taken at Vancouver, Columbia R. Others received by exchange."

EVIDENCE FOR HURRICANE TRANSPORT AND DISPERSAL OF AQUATIC HEMIPTERA

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University of California, Berkeley

Although Aerobiology, the study of the dissemination of insects, pollen, microörganisms and other objects, has attracted considerable interest, very little attention has been paid to the part that tropical disturbances play in the transport of insects. Hurricanes are not rare phenomena but occur with amazing frequency in the tropics and provide a dynamic means of distributing organisms.

Three species of water-striders have long held my interest as they are all of West Indian and Central American origin and one in particular was definitely introduced by the hurricanes that lashed Florida in 1947 and again in 1950.

The Fall of 1947, particularly September and October, was

one of much tropical disturbance in Florida. Hurricanes originating in the French West Indies struck the coast time after time. These storms, like most hurricanes of the area, began in the Lesser Antilles and moved northwestward across Puerto Rico, Dominican Republic, then across Cuba or the Bahamas into Florida.

When the weather cleared, after a particularly severe hurricane of 1947, I had occasion to collect insects in the Florida Keys. On Big Pine Key, Monroe County on November 27, I found a large colony of *Rheumatobates minutus* Hungerford and *Microvelia portoricensis* Drake. Both species were known before from Puerto Rico and in the case of *R. minutus*, Yucatan and Panama also. I collected many specimens from a small pond in coral rock. The pond was a temporary one that had been filled by the heavy rains of the preceding storms. The two species apparently did not become established as further collecting in the early Spring of 1948 failed to reveal a single specimen. Additional evidence for the hurricane transport of *R. minutus* is shown by its sudden appearance on a small pool at Florida Southern College in Lakeland. It was discovered at the end of the hurricane season of 1950. The small pool on the campus of the university was under almost daily examination by Dr. Roland Hussey prior to the appearance of this insect, so it could have hardly escaped his attention. As in the case of the Florida Keys colony, this one did not become established either but disappeared in a few days. Both alate and apterous forms were collected in the Keys; Dr. Hussey reports alate and partially de-alated specimens from Lakeland.

The third species is *Rheumatobates clanis* Drake and Harris, known previously from British Honduras and northwestern Cuba. I collected it from salt water on the Gulf coast of Florida (Bayport, Hernando County) on a single occasion after the hurricane of 1947, mentioned above. Whether this species has become established is unknown..

It seems plausible that all three of the above species were transported in the adult stage, inasmuch as I do not have nor do I recall seeing nymphs of any of these species. It seems unlikely that eggs or nymphs could have been transported, reached the adult stage yet not managed to survive for a few months.

PREY OF ROBBER FLIES OF THE GENUS STENOPOGON
(Diptera:Asilidae)

FRANK R. COLE
University of California, Berkeley[1]

The genus *Stenopogon* is one of the dominant groups of rather large robber flies found in the western United States; only one species is known east of the Mississippi Valley. These flies are strong and active hunters and rather indiscriminate in their choice of food. The writer has just finished classifying the material in the collection of the California Insect Survey, where 20 of the 23 known California species are represented; it is quite evident from this study that the species *S. rufibarbis* Bromley is the most abundant and widespread in California, and most of our prey records refer to this species.

Robber flies feed on a vast array of insects, piercing their prey with a strong beak (hypopharynx) and sucking the body fluids from soft bodied flies and butterflies or heavily armored beetles. Many species are attracted to social Hymenoptera for their food, or to many of the solitary wasps and bees; there is even a record of a large *Pepsis* wasp having been taken by an asilid, *Saropogon* (Hurd. 1952:269). Bromley published several lists of the prey of different species, beginning in 1914, and found that some asilids "specialized," while others were general feeders.

The fragile little robber flies of the genus *Leptogaster* usually attack small ground spiders or winged aphids; certain species of *Stichopogon* also prey on small spiders. The huge flies of the genus *Proctacanthus* often capture butterflies and grasshoppers, but also rely on honeybees for food. Banks (1913) noted that many robber flies preferred to try for their food among the Hymenoptera. Linsley (1944) published a paper on the prey of the asilid *Callinicus calcaneus* in California; here the prey consisted entirely of megachilid and andrenid bees, with an apparent preference for the bright colored *Osmia* species rather than the more abundant but dull colored *Andrena* species.

Melin (1923) published a most complete work on the biology of the Swedish asilids, in which he described the habits of practically all of the known species of Sweden; he described the speci-

[1] The writer is indebted to several entomologists for the determination of asilid prey. Dr. Herbert Ruckes determined the Hemiptera, Dr. Paul D. Hurd, Jr. named the Hymenoptera and miscellaneous and Jerry A. Powell the Lepidoptera.

alized mouth structures of the species and furnished excellent illustrations.

The battle for life and food does not always go to the robber fly, as various observers have noted that large web-spiders or large wasps may capture and kill the predatory asilid flies. Bromley (1914) saw a *Crabro* wasp capture and kill the large *Erax aestuans*. Harshbarger (1894) describes a combat between a large American Mantis, *Stegomantis carolina*, and a large species of *Asilus*, which ended in the robber fly losing his legs and his proboscis and escaping when the observer interfered!

We have four prey records for *Stenopogon breviusculoides* Bromley, all from central Califronia; the most interesting is the capture of the mantid, *Litaneutria minor* (Scudder), a specimen taken by Hurd. The same species of robber fly captured the large bombyliid fly *Poecilanthrax arethusa* O. S. and a small bee of the genus *Lasioglossum* (specimens collected by Hurd). There is also one record of the capture of a honeybee (specimen collected by W. C. Bentinck).

In his "Robberflies of Texas" (1934) Bromley recorded the prey of three species of *Stenopogon*. The species *aeacidinus* Williston took a small syrphid fly, a blister beetle *(Epicauta)*, a smaller male robber fly of its own species and a stink bug, *Thyanta custator* Fabricius. The asilid *S. latipennis* was captured with a small grasshopper nymph of *Melanoplus* and a different stink bug, *Chlorochroa uhleri* Stål. The asilid *S. subulatus* Wiedemann was taken with a female grasshopper of the genus *Melanoplus*.

In July, 1946, Paul Hurd and Ray F. Smith noticed many specimens of a *Stenopogon* fly while sweeping alfalfa patches at Cedarville and Lake City in Modoc County, California. The species of fly proved to be *S. rufibarbis* Bromley. Seventeen specimens of this robber fly were captured with honey bees (there was a hive near the alfalfa field), some of the predators had taken other insects and a few were without prey. One fly had taken the bee *Anthophora urbana* Cresson, one had taken a winged ant of the genus *Formica*. This species of robber fly was taken with the rhagionid fly, *Dialysis lauta* Loew, at Strawberry, Tuolumne County, California, July 20 (W. C. Bentinck), also with the brilliant colored beetle, *Dichelonyx* sp. in Hope Valley, Alpine

County, California (J. W. MacSwain) and with the beetle *Serica anthracina* Le Conte at Sonora Pass, 9000 feet, Tuolumne County, and Summit Camp, Lassen County, California, June (Hurd). This common asilid was recently taken at Strawberry, California, June, with the bug *Peribalus tristis* Van Duzee as prey.

Two other species of *Stenopogon* in the survey collection have been pinned with prey. *S. cazieri* Brookman was taken with the small butterfly, *Strymon saepium* Boisduval, San Antonio Valley, California, June (C. D. MacNeill). *S. obscuriventris* Loew was taken with the brilliant blue beetle, *Chrysocha cobaltina* LeConte, at Mt. Laguna, San Diego County, California, July (B. J. Adelson), also taken with a green pentatomid, *Thyanta pallidovirens* Stål, in Del Puerto Canyon, Stanislaus County, California, April (Hurd).

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A SMALL COLLECTION OF DIPTERA FROM MAGUEY NEAR MEXICO CITY, MEXICO

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While visiting the ganaderia of Don Roberto Sanchez Tapia near Tlalnepantla, Mexico City, Mexico, on November 10, 1955, a maguey plant (*Agave* sp.) was observed with nearly a liter of foul water in the base. The center of the plant, normally used by local people for making pulque, had apparently been removed several months before as large rat-tailed maggot larvae were then evident in the wet cavity. Several other plants with the centers rotted away were also inspected, but no other collections were found. These maguey plants were randomly distributed over open hilly country between 2200–2400 meters, although plots of maguey under cultivation were also observed on flat hilltops nearby.

In this region rainfall drops off rapidly after September with monthly averages of 122.3 mm., 38.0 mm., 16.6 mm., and 8.8 mm. being recorded from September through December. Average monthly temperatures for the latter part of the year as measured at nearby Teoloyucan are September 16.5° C., October 14.7° C., November 13.2° C., and December 12.4° C.

The sample of foul water and samples of moist organic debris present in an encrusted layer just above the water line in the base of the maguey were taken to a residence in Mexico City to observe and record emergence of the insect forms then in an immature stage. A few larvae and pupae of the mosquito *Culex stigmatosoma* Dyar were apparent in the water and emergence of adults continued for about a week after the sample had been removed from the field. Several larvae belonging to the family Heleidae were present in the ooze removed from the bottom of the cavity. They become quite active after the water with its rich organic content was placed under room conditions. An adult male determined as *Culicoides albomacula* R. & H. emerged on January 1, 1956, but the others were apparently lost due to an oily scum which appeared at the surface as decomposition of the organic matter continued. Judging by the time necessary for *C. albomacula* to complete its development, this species probably overwinters in the larval stage similar to tree-hole *Culicoides* in

the United States. The syrphid larvae were also affected adversely by the scum and did not survive beyond January. Judging by their size and length of the posterior air tube, they are probably larvae of the genus *Meromacrus* or *Eristalis*. In an effort to strand the scum on the sides of the container, the rearing jar was tilted excessively and the water level replenished by tap water during the first week in January. Several days later a mosquito larva with a silvery abdominal sheen was noted actively moving among the debris. Within two weeks pupation had taken place and a female *Aedes muelleri* Dyar later emerged. It is probable that some temperature or chemical conditioning was necessary before the egg would hatch upon submergence since ample opportunity for wetting occurred when the collection was brought from the field to Mexico City in November over very poor roads. As a member of the *Ochlerotatus* group, it was not expected that *A. muelleri* would occur in maguey but rather in ground pools. Samples of moist debris from the encrusted ring which occurred around the inner part of the maguey plant just above the water line were also productice of adult Diptera. In January a female dolichopodid of the genus *Medetera* and a muscid fly of the genus *Coenosia* emerged from this layer. Representatives of both genera are commonly reared from moist debris in tree cavities in the United States. A fungivorid, *Leiaamabilis* (Will.), also appeared from the sample of moist debris in January. A female pseudoscorpion of the genus *Dinocheirus* sp. was found crawling in the debris after the sample was taken from the field.

The occurrence of both *A. muelleri* and *C. albomacula* in maguey is of interest since the larval habitat of neither species has previously been defined in the type locality (Mexico City).

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